

ABSTRACT

Title of dissertation: CHORAL CONSONANTS: DEVELOPING A
BALANCED APPROACH TO ARTICULATION AND
RESONANCE

Allan Zester Laino, Doctor of Musical Arts, 2015

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Much attention has been given to vowels in both singing and choral pedagogy. The relationship between consonants and the singing voice has not been addressed as thoroughly. This is evidenced by the prevalence of choral vocalizations that target proper vowel production but lack careful consideration of consonants. While a bias toward vowels may be appropriate, given that they are prolonged in singing and consonants generally are not, highlighting their coexistence rather than the dominance of one could lead to better use of the complete instrument.

The purpose of this study is to devise strategies for collegiate choirs that develop complete facility of articulation. A review of past and present trends in vocal pedagogy literature will highlight important viewpoints regarding consonant production that serve as a foundation for the development of exercises. A review of choral pedagogy literature will reveal the need for practical exercises that allow for a balanced approach to articulation and resonance.

The final section contains choral exercises that may be implemented into the warm-up period of a typical collegiate choir. Most of the exercises are derivatives of well-established exercises proven to be useful for the development of choral tone. They contain transcriptions of recommended phonemes, concise explanations of guiding principles, and suggestions for pedagogical procedures. The collection is presented as a progressive study that targets specific consonant-related issues. By incorporating various consonant and vowel combinations into exercises, issues that are typically handled on a case-by-case basis while working on repertoire are encountered during the warm-up period where they can be used as technique-building devices.

CHORAL CONSONANTS: DEVELOPING A BALANCED APPROACH TO
ARTICULATION AND RESONANCE

by

Allan Zester Laino

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INTRODUCTION

Much attention has been given to vowels in both singing and choral pedagogy. The relationship between consonants and the singing voice has not been addressed as thoroughly. This is evidenced by the prevalence of choral vocalizations that target proper vowel production but lack a careful consideration of consonants. While a bias toward vowels may be appropriate, given that they are prolonged in singing and consonants generally are not, highlighting their coexistence rather than the dominance of one could lead to better use of the complete instrument.

The purpose of this study is to devise strategies for collegiate choirs that develop complete facility of articulation. A review of past and present trends in vocal pedagogy literature will highlight important viewpoints regarding consonant production that serve as a foundation for the development of exercises. A review of choral pedagogy literature will reveal the need for practical exercises that allow for a balanced approach to diction and resonance.

The paper presents basic anatomy and physiology of the vocal articulators—the lips, the tongue, the jaw, and the velum. This foundational knowledge, along with findings in phonetics, acoustics, and lyric diction, will support an analysis of consonants encountered in lyric diction for English and Latin. The analysis identifies the pedagogical uses of consonants and common consonant-related vocal faults.

The final section contains choral exercises that may be implemented into the warm-up period of a typical collegiate choir. Most of the exercises are derivatives of well-established exercises proven to be useful for the development of choral tone. They contain transcriptions of recommended phonemes, concise explanations of guiding

principles, and suggestions for pedagogical procedures. The collection is presented as a progressive study that targets specific consonant-related issues.

The study of diction is complex and time-consuming. Many undergraduate diction courses rely on speech and writing for both practice and assessment. Speech is effective for introducing fundamentals, but success in spoken diction does not necessarily lead to success in sung diction. Even when sung performances are included in the curriculum, class size and time constraints typically do not permit students to have sufficient guided practice with diction problems that arise *while singing*. Student progress in applied diction must be monitored by their private teachers and choral directors. In a typical collegiate setting, voice students spend more hours singing in choral rehearsals (thus, encountering most diction problems in front of the choral director) than for their private teachers. The most disadvantaged students are the non-majors—the majority in most collegiate choirs—who do not reap the benefits of private lessons or diction courses. Symbols from the **International Phonetic Alphabet (IPA)**¹ are presented in digestible units, which affords directors the opportunity to teach IPA and connect elements of diction to singing practice.

Throughout the paper, a distinction is made between square brackets [] and forward slashes /. Standard practice in music literature utilizes square brackets only to indicate an IPA transcription. In phonology, square brackets are used to indicate detailed transcriptions while slashes are used to indicate allophonic symbols. A single **allophone** may have numerous possibilities for pronunciation, depending on the language. For example, /r/ may refer to a trill [r], a tap [ɾ], or a retroflex r [ɻ] in English, or a uvular trill

¹ See Appendix for the 2005 IPA Chart.

[ʀ] in French. According to Leslie De'Ath: "In most instances, the bracketed transcription used in lyric diction texts should more correctly be rendered as slashes."² Recent articles in the *Journal of Singing* have adopted proper usage of brackets and slashes.

² Leslie De'Ath, "The Merits and Perils of the IPA for Singing," *Journal of Singing* 57, no. 4 (March/April 2001), 57-68.

CHAPTER 1: REVIEW OF VOCAL PEDAGOGY LITERATURE

A review of vocal pedagogy literature published from 1840 onward will highlight important perspectives regarding consonant articulation that will serve as a foundation for the remainder of this study. 1840, the year of publication for Manuel Garcia's *Traité complete de l'art du chant*, marks a point where pedagogical tools, exercises, and vocalises began appearing alongside theoretical writing. Between Garcia's generation and the early twentieth century pedagogues, respiration and registration were at the forefront of virtually every pedagogical method. This coincided with the growing demand for powerful voices that could coexist with larger orchestras and concert halls, louder instruments, and thicker orchestrations.¹ The topic of vocal articulation was largely confined to vowel formation because, according to the wisdom of the time, consonants did little to serve full and resonant singing. Nevertheless, several notable teachers of the historic Italian School incorporated consonant articulation into their pedagogy. The pedagogues discussed below are representative figures of their time.²

Garcia

Manuel Patricio Rodriguez Garcia (1805-1906) was the most prominent figure of the Romantic *bel canto* school. He was chief among the vocal pedagogues in the late-nineteenth-century who used scientific evidence to justify teaching practices. The son of a prominent Spanish tenor who trained in the Porpora method, he inherited the tradition

¹ Karen Sell, *The Disciplines of Vocal Pedagogy: Towards an Holistic Approach* (Burlington, VT: Ashgate, 2005), 31.

² For additional viewpoints of pedagogues who have gone unmentioned, refer to the bibliography. Sell, Coffin, Miller, and Stark have conducted historical reviews of vocal pedagogy.

that emphasized beautiful tone, elegant phrasing, and virtuosity.³ As his career progressed, he veered from Italianate practices and advocated controversial techniques such as *coup de glotte* (stroke of the glottis) and low-larynx singing. He laid the groundwork for modern vocal pedagogy by connecting his teaching to scientific, anatomical, and physiological investigation. He identified the singing voice as having four principal mechanisms: (1) the lungs, (2) the glottis, (3) the pharynx, and (4) the organs of articulation.⁴ (Over a century of scientific advancements and a more systematized understanding of anatomy allowed Ralph Appelman to redefine the “quadripartite mechanism”⁵ as one that coordinates: (1) respiration, the will to breathe, (2) phonation, the will to utter a sound, (3) resonance, the will to form a particular vowel position, and (4) articulation, the will to communicate by forming both vowel and consonant.)⁶ By Garcia’s standards, a singer possessing technique has mastered the specific functions of each mechanism and can perform them “without disturbing the operation of the other apparatuses.”⁷

In Part One of his magnum opus, *Traité complete de l’art du chant*, Garcia presented 199 exercises without words or consonants.⁸ The first fifteen exercises comprise sustained notes, slow stepwise motion, and leaps with *portamento* in order to

³ Charles Osborne, *The Bel Canto Operas of Rossini, Donizetti, and Bellini* (Portland, OR: Amadeus Press, 1994), 1.

⁴ Ibid., 27.

⁵ Richard Miller’s term from *The Structure of Singing: System and Art in Vocal Technique* (New York, NY: Schirmer Books, 1986), 197.

⁶ D. Ralph Appelman, *The Science of Vocal Pedagogy: Theory and Application* (Bloomington, IN: Indiana University Press, 1967), 9.

⁷ Manuel Garcia II, *A Complete Treatise on the Art of Singing: Complete and Unabridged*, trans. Donald V. Paschke (New York, NY: Da Capo Press, 1975), 28.

⁸ Ibid., 38. /h/ is used in Exercises 170-71 to develop aspirated vocalization (*vocalization aspirée*) on fast repeated notes.

focus on the “emission of the voice.”⁹ The remaining exercises comprise scales, arpeggios, coloratura figures, and ornamental figures designed to develop agility. Following this extensive focus on vowel production, Garcia addressed the challenges of articulation at the outset of Part Two in his *Traité*. He wrote, “When the singer has not carefully analyzed *the mechanism which produces the vowels and the consonants*, his articulation lacks ease and energy, he does not know the secret of keeping in the voice the development and equality which he would obtain in simple vocalization.”¹⁰ He recognized that underdeveloped articulation would likely undermine the consistency of tone gained through the vocalises.

Garcia discussed a few faults that originate in the organs of articulation. He listed examples of inadvertent vowel sounds that appear when singers mishandle consonant junctures in Italian words such as /tɛ m ə po/ instead of /tɛm po/ for “tempo.”¹¹ He attributed a lack of rhythmic control to the inaccurate placement of consonants.¹² He discouraged consonant omission in high tessitura, especially when the word relied on the consonant for intelligibility and drama. Citing a climactic moment from Rossini’s *Otello* where a tenor would be tempted to omit the /p/ from “père” to optimize the vowel on a G4, he wrote, “that heart-rending exclamation would immediately lose all its vigor; and never believe that it would suffice to yell more loudly in order to reinstate to the sound the value that it would receive from the consonant.”¹³

⁹ Garcia, *Treatise*, 1.

¹⁰ Ibid., 2.

¹¹ Ibid., 16. This is Paschke’s International Phonetic Alphabet (IPA) transcription. IPA was not used in Garcia’s time.

¹² Ibid., 27.

¹³ Ibid., 25.

Garcia's primary concern was to guard against disruption of *legato*. Singers that failed to "support the expiration" or allowed consonants to interrupt the flow of air weakened the continuity of sound.¹⁴ He offered this advice for the development of *legato* on texted music:

In order to train the organs, to develop all their force, or to overcome their habitual softness, it is necessary to endeavor to join to each syllable the consonants of the following syllable, and to make the encroachment heard in the pronunciation. In this manner, *the vowels will always be found to begin the syllable, and the consonants to finish it.*

Examples:

Deh parlate che forse tacendo
/Dep arl at ek ef ɔrs et atʃ ɛnd o/¹⁵

Garcia directed attention to vowels by bringing them to the forefront of every syllable. This orthographic alteration taught singers to align the vowels with the beat and to think of consonants as quick transitional elements. He encouraged this type of practice for training purposes, but cautioned against lingering in this mode for too long, believing the expert singer should have more freedom in consonant execution. He encouraged consonant stresses for the following situations: (1) to help overcome a mechanical difficulty, (2) to express sentiment, and (3) to project articulation in a large room.¹⁶ He recommended writing important consonants above words to assist in the preparation and execution of stressed consonants.¹⁷

¹⁴ Garcia, *Treatise*, 29.

¹⁵ Ibid., 17.

¹⁶ Ibid., 23.

¹⁷ Ibid., 22.

Marchesi

The immediate successor to Garcia was Mathilde Marchesi (1821-1913), a German mezzo-soprano who studied with Garcia and then became a prominent teacher of female singers in Paris. She observed that voice teachers either used virtuosic exercises too difficult for beginners, or did not use them at all. Reflecting on her experience as a student, she wrote: “I conceived the idea of composing *vocalizzi*, each of which should contain an exercise, on the scale, on arpeggios, the mordent, the trill, etc., and all in melodic form ... I believe my idea to have been correct, for to proceed directly from the scale to the singing of an air impressed me, while I was but a student myself, as a too great step.”¹⁸ She believed the most effective way to build a voice was to focus on a single obstacle at a time, and to present each obstacle in a “natural and progressive order.”¹⁹

Marchesi’s greatest contribution to pedagogical literature was her collection of *vocalizzi*, which demonstrated a systematic approach to voice building. The first part of her method, *Elementary and Progressive Exercises for the Development of the Voice*, introduced simple techniques such as *portamento*, *arpeggio*, and register blending with plain accompaniment. The second part, *Development of the Exercises in the Form of Vocalises*, presented technical challenges in melodic form with harmonically rich accompaniment and varied rhythm, akin to nineteenth-century instrumental études. By presenting different vocal maneuvers in song form, Marchesi added musical value to purely technical challenges, bridging the transition between the vocalization of exercises

¹⁸ Mathilde Marchesi, *Ten Singing Lessons* (New York, NY: Harper & Brothers, 1901), 87.

¹⁹ Mathilde Marchesi, *Theoretical and Practical Vocal Method*, trans. Philip Lieson Miller (New York, NY: Dover Publications, 1970), vii.

and the singing of arias. The final part of her method addressed technical challenges **with words and consonants**. The author was unable to locate “Part Three” of the Marchesi method. She referred to it in the Preface of the 1970 publication cited above, but the actual text ends at Part Two.²⁰ Other Marchesi vocalise sets (e.g. Opus 32) utilize solfège syllables but no words.

Stockhausen

Julius Stockhausen (1826-1906), another student of Garcia, moved further than his contemporaries toward the study of consonant articulation. It may be that his German background—having the most consonant-laden language of standard repertory—and professional experience as a performer of *Lieder* led him to consider consonants more thoroughly. He believed certain consonants could be used as illustrative devices to teach singers about the internal workings of the larynx. He claimed the lips lessened in tension when pronouncing the phonemes /pa/, /ba/, and /ma/ successively. In his 1884 treatise, he wrote: “Compare, for instance, *pa* and *a*, *ba* and *a*, *ma* and *a*, while imitating with the vowel attack the relaxation of the tensions on the lips. It will then be found that, in order to sing with expression, the vowel attack has to be quite as varied as the consonant attack. The latter being visible serves to explain the former, which is invisible.”²¹

²⁰ Marchesi, *Theoretical and Practical Vocal Method*, xvii. “After finishing the course of Vocalises, the pupil should pass on to the third part of my Method, which contains vocalises with words, and where still further purely mechanical difficulties will be found.”

²¹ Julius Stockhausen, “A Method of Singing Part III,” trans. Sophie Löwe, *The Voice* 10, no. 3 (March 1888), 44-45, quoted in Stephen Austin, “Stockhausen’s Method of Singing,” *Journal of Singing* 65, no. 3 (January/February 2009): 360. This was a clearer explanation of Garcia’s controversial *coup de glotte* (stroke of the glottis) which, due to misinterpretation, had been a topic of debate.

In addition to using consonants for conceptual demonstrations, he also included them in vocalises and repertoire-learning for advanced students as well as beginners. Unlike his contemporaries, he preferred **not to isolate vowels at the outset**. He thought “all sounds in the singer’s alphabet should be studied,”²² which meant that each of the fifteen vowels and twenty-two consonants of German needed continuous attention.²³ Despite these claims, his pedagogical writings did not provide advice for each of the phonemes; instead, he encouraged teachers to use *sofège* and its particular consonants, /d, r, m, f, s, l/. He believed the syllables of *sofège* were more valuable to singing than vowels alone because they helped singers develop intervallic reading, rhythmic accuracy, and the foundation for lyric pronunciation.

It is needless to add that sol-fa-ing also forms the basis of a good pronunciation, and of sustained singing in general, if the teacher takes care that each vowel is distinctly articulated, and that the consonants *d, r, m, f, l* are correctly employed, according to their length and character. **The habit of pronouncing well in sol-fa-ing transfers itself, later on, to the words of the text** [emphasis mine]. Technically, it is much the same thing whether the melody is practiced with the names of the notes or with the words, but the former is easier and therefore slow vocalises sol-fa-ed are better for beginners than songs, which distract their attention from the actual tone-production. It also seems much more logical, in default of good exercises, to sol-fa beautiful songs and airs, instead of adapting words to inferior vocalises as has been done of late.

It is a notable fact that the Italians, who pronounce and accentuate their language most distinctly, and articulate single and double consonants rapidly and clearly, make the best singers. Those who have heard Lablache, the greatest singer of modern times, will agree with me that the combination of word and tone in such perfection can only be achieved by those, who, from their youth upward, have learned to pronounce vowels and consonants distinctly and beautifully by means of the solfeggio.²⁴

²² Berton Coffin, *Historical Vocal Pedagogy Classics* (Metuchen, NJ: Scarecrow Press, 1989), 39.

²³ Sell, *The Disciplines of Vocal Pedagogy*, 27.

²⁴ Julius Stockhausen, “A Method of Singing, Part V,” trans. Sophie Löwe, *The Voice* 10, no. 5 (May 1888), 72-73, quoted in Stephen Austin, “Stockhausen’s Method of Singing (Continued),” *Journal of Singing* 65, no. 5 (May/June 2009): 607-608.

Furthermore, he believed consonants allowed the voice to have momentary yet frequent periods of rest.

When the singer practices on his mysterious hidden instrument, the syllables *do re mi fa sol la si* form, as it were, little levers which help to bring out the sound, like the keys of the piano and organ, or the valves in wind-instruments. The obstruction which the air experiences in the articulating-cavity seems to increase the tension and to favor the contraction of the glottis, which is required for the formation of sound. **The variety in the formation of the elements of speech, by momentarily relieving the vocal cords of the constant expulsion of air, forms short moments of rest for the voice** [emphasis mine]. The emission of consonants acts on the vocal cords almost like blinking does on the eye.²⁵

Stockhausen is regarded as a pioneer of the linguistic approach to vocal pedagogy, yet further progress was not made until the latter half of the twentieth century. The major literature published by his contemporaries and the succeeding generation lacked in-depth discussions of consonant articulation, or merely reiterated his concepts. Francesco Lamperti (1813-1892), his son Giovanni Battista Lamperti (1839-1910), and Emma Seiler (1821-1887) agreed that *solfège* was of greatest importance to the study of articulation, but little was said other than the need for quick consonants and clear pronunciation.²⁶ F. Lamperti wrote a text separate from *The Art of Singing* (1890) that focused on the art of pronunciation, but it was never published.²⁷

The early twentieth century witnessed the establishment of national styles of singing in France, Germany, Northern Europe, Russia, and Britain. Motivated by a desire to create new tonal ideals distinct from the historic Italianate school, writers concentrated on arguments for various breathing techniques (abdominal, diaphragmatic, clavicular,

²⁵ Julius Stockhausen, "A Method of Singing, Part V," trans. Sophie Löwe, *The Voice* 10, no. 5 (May 1888), 72-73, quoted in Stephen Austin, "Stockhausen's Method of Singing (Continued)," *Journal of Singing* 65, no. 5 (May/June 2009): 607.

²⁶ Coffin, *Historical Vocal Pedagogy Classics*, 56-69.

²⁷ *Ibid.*, 61-62.

lateral, and intercostal), the number of registers, correct posture, and vowel formation.²⁸

Advancements in the linguistic approach to vocal pedagogy continued in the 1960s with the phonemic and phonetic work of D. Ralph Appelman.

Appelman

D. Ralph Appelman's *The Science of Vocal Pedagogy* (1967) has been a fixture in singing science since its publication.²⁹ It is an exhaustive text that gathered acoustic, linguistic, and physiological research to explain the mechanics of singing. He discussed four objectives in his preface, but the driving force behind the work seems to be that of text intelligibility. Based on his personal observations, he claimed that most voice teachers indiscriminately applied **vowel migration** (vowel modification)—adjusting the vocal tract to match formants with formants in order to enhance resonance—sacrificing phonemic accuracy for the teacher's sound preference. He believed that “in song, the word is as important as the sound,”³⁰ and he thought it to be true for operatic, choral, chamber, staged, unaccompanied, and orchestral settings.

In attempt to create an objective method of teaching based on fact rather than personal aesthetics, Appelman believed it was necessary for teachers and students to understand sung sounds from a phonetic perspective. Thus, Part Two of his book served as a complete guide for English lyric diction. Because of linguistic inconsistencies,

²⁸ An overview of the work of William Shakespeare, Herbert Witherspoon, Enrico Delle Sedie, Giovanni Sbriglia, Emile Behnke, and Lilli Lehmann can be found in Karen Sell, *The Disciplines of Vocal Pedagogy: Toward an Holistic Approach* (Burlington, VT: Ashgate, 2005), 27-32.

²⁹ As was William Vennard's *Singing; The Mechanism and the Technic*, published in the same year.

³⁰ Dudley Ralph Appelman, *The Science of Vocal Pedagogy; Theory and Application*. (Bloomington, IN: Indiana University Press, 1967), 171.

inexperienced students could not rely on printed word to determine correct phonemes to be sung.³¹ He believed a full working knowledge of the IPA was necessary to supplement auditory stimuli, which could vary between teachers and dialects. He wrote: “Teachers of voice always have relied upon the auditory process for phonemic identification, and many students have developed fine techniques by imitating speech signals through auditory stimuli alone. Therefore, in learning to produce a sound they are not particularly aware of the fine manipulation of the articulators.”³² One of the most important aspects of early training involved teaching the student to increase his awareness of articulatory movement. “He [then] begins to conceive the vowel physiologically instead of tonally, and his ability to reproduce this phoneme correctly is greatly increased.”³³

Appelman’s case for higher prioritization of consonants was rooted in his concern for intelligibility. He claimed listeners relied on consonant intelligibility not only for the consonants themselves, but also because they helped to increase vowel intelligibility. “Since identification of vowels is very difficult when they are isolated from their consonantal environment, a reasonable assumption is that the movement of the articulators provides a significant cue for vowel recognition in speech.”³⁴ Therefore, “the most intelligible sung word is one in which each consonant may be heard and in which each vowel is sung with a preconceived phonemic accuracy.”³⁵

Regarding technique, Appelman believed good diction was of the highest priority, and it mandated proper attention to the execution of vowels and consonants.

³¹ Appelman, *The Science of Vocal Pedagogy*, 220.

³² Ibid., 217.

³³ Ibid., 217.

³⁴ Ibid., 219.

³⁵ Ibid., 219.

“Pronunciation should be considered before timbre because, when the singer concentrates upon the timbre of the sound, he frequently destroys the integrity of the vowel, and when he concentrates on the vowel he enhances the timbre.”³⁶ For generations, tenets of the historic Italianate school advocated maximum duration of vowels and minimum duration of consonants. Appelman presented this argument against the norm:

Rapid articulation of the consonants is not the goal of good diction and such an illustration is very misleading. The maintenance of a legato line depends upon a rapid movement from one vowel position, through the consonant to the following vowel in such a manner that **neither vowel is affected by the consonantal articulation. The consonant must have enough duration to possess undeniable entity in the vocal line. It must complement the vowel, but although it is of shorter duration, it must never be of lesser importance than the sustained sound** [emphasis mine]. To move rapidly and accurately from vowel to consonant to vowel, always within the rhythmic framework, demands flexibility of jaw, lips, mouth, and tongue. This positive action must occur slightly before each beat point to permit the vowel sound on the beat; therefore, every consonant must be slightly anticipated by a proper preparation of the articulators. The major mistake in forming consonants is that the mouth, lips, and tongue are not sufficiently supple to provide timing of mouth, tongue, and jaw movements for each successive sound. The total effort often is not synchronized and coordinated muscularly.³⁷

Coffin

Berton Coffin used a phonetic approach to voice teaching. His primary focus was the development of the Chromatic Vowel Chart,³⁸ a guide for adjusting the vocal tract resonance to match a harmonic of the sung pitch. His strategy for consonants, although less sophisticated, was also based on modification. He believed studying “the various colors of vowels and the various gradations of consonants” was necessary to meet the

³⁶ Appelman, *The Science of Vocal Pedagogy*, 219.

³⁷ Ibid., 238.

³⁸ Berton Coffin, *Overtones of Bel Canto: Phonetic Basis of Artistic Singing with 100 Chromatic Vowel-Chart Exercises* (Metuchen, NJ: Scarecrow Press, 1980).

demands of modern performance.³⁹ He claimed bigger venues, louder instruments, and thicker orchestration put great demands on singers. He said, “The best that can be done is to evolve a technique which will be the most efficient and long lasting. *We believe this is as much concerned with consonants as with vowels.*”⁴⁰

Most of Coffin’s advice for consonants dealt with aspiration in American English. As a member of the *bel canto* tradition, Coffin promoted the substitution of aspirate American consonants with Italian consonants that were more favorable to overall resonance. American English has certain constrictions that “interfere with free vocalization unless certain consonants are modified.”⁴¹ Americans tend to articulate /d, n, t/ and /l/ on the alveolar ridge, a “dead spot in the mouth.”⁴² He claimed that dentalizing these consonants, as in Italian, helped to free resonance because it allowed the tone to continue with “minimum interference.”⁴³ His procedure is summed up in this passage:

“After several years of teaching the favorable vowels, it has become more and more apparent that most of the problems which have showed up in the songs or arias are involved with consonants ... We have observed a principle: *the problem can be solved if the velocity of the airflow in the consonant is made to approximate the airflow in the vowel which follows or precedes it.* This means that the unvoiced plosives can soften towards their voiced partners and the unvoiced fricatives can modify towards their buzzed partner.”⁴⁴

In other words, unvoiced plosives such as /p, t/ and /k/ should be modified toward /b, d/ and /g/, and unvoiced fricatives such as /s, f, θ/ and /ʃ/ should be modified toward /z, v, ð/ and /ʒ/ if one’s goal was to optimize the resonance of the following vowel.

³⁹ Coffin, *Bel Canto*, 6.

⁴⁰ Coffin, Berton, *Historical Vocal Pedagogy Classics* (Metuchen, NJ: Scarecrow Press, 1989), 210.

⁴¹ *Ibid.*, 222.

⁴² *Ibid.*, 223.

⁴³ *Ibid.*, 216.

⁴⁴ *Ibid.*, 227.

Miller

Richard Miller became the most influential author on vocal pedagogy in North America at the end of the 20th century. He served as a mediator between voice science research and its practical application in studio teaching. Similar to Appelman's four-part system, he recognized the singing voice as a "quadripartite mechanism" that depended on: (1) the source of power, (2) the vibratory action, (3) systems of resonance, (4) the facility of articulation.⁴⁵ He showed that skilled singing required full command of each action, and each action must be trained separately as well as in combination. For the purposes of this study, the value of his writing lies in the well-formulated exercises he prescribed for developing the facility of articulation, and his diagnosis of common errors associated with consonant production.

Miller believed consonants could be used to advance technique rather than inhibit it. "The consonant, whether voiced or unvoiced, need not play villain to the heroic vowel, but can serve as a **beneficial agent** in delineating the vowel more plastically than would otherwise be possible were one continuous string of vowel sounds be sung."⁴⁶ This is true when consonants are used for specific purposes in vocalises. Miller included two important chapters (Chapter 6 and 7) on assisting resonance balancing with consonantal phonemes in *The Structure of Singing*.⁴⁷

He used the nasal continuants /m, n, ŋ/ and /ɲ/ to increase students' awareness of vibratory sensations in the nasal and sinus areas. These sensations were used to guide

⁴⁵ Richard Miller, *The Structure of Singing: System and Art in Vocal Technique* (New York, NY: Schirmer Books, 1986, 197.

⁴⁶ Richard Miller, *On the Art of Singing* (New York, NY: Oxford University Press, 1996), 20.

⁴⁷ Miller, *Structure of Singing*, 79-107.

resonance in succeeding vowels. While each phoneme produced similar sensations, Miller carefully explained the distinctness of each and their various pedagogical uses. By initiating tone through various nasal continuants, students experience resonance tuning while limiting faulty vocal tract adjustments that often occur when beginners aim for “forward placement” on vowels alone. Other uses of the nasal continuants include correcting excessive depression in the larynx and jaw.⁴⁸

Miller’s resonance balancing exercises for non-nasal consonants demonstrate his attention to the uniqueness of each articulatory configuration. Each consonant is used to accomplish a specific task. /l/ was deemed a keystone consonant that could be used to introduce quick and precise tongue action that would “serve as a model for all other alveolar consonants.”⁴⁹ While /d/ is often a problematic consonant that can induce vocal tension (due to increased subglottic pressure, vocal fold approximation, blocked nasopharynx, and tongue elevation), it may be used to promote glottal closure, forward tongue placement, and a moderate dropping of the jaw.⁵⁰ The sequencing of exercises was carefully planned so that basic concepts were introduced slowly, often on sustained speech sounds that then moved progressively through different musical patterns. Melodic, rhythmic, and syllabic variations in the exercises help singers to develop awareness of each vocal tract adjustment. The teacher’s responsibility is to monitor the vowels so that they are not “truncated” or contaminated by transition sounds.⁵¹

⁴⁸ Miller, *Structure of Singing*, 88.

⁴⁹ Ibid., 92.

⁵⁰ Ibid., 100.

⁵¹ Ibid., 93.

In his 1996 publication, *On the Art of Singing*, Miller identified seven “prevalent types of error associated with the singing of consonants.”⁵² His conclusions are summarized in Table 1. The list of faults combined with his vocalises for consonants make up a guide for articulatory training that is technical, practical, and based on studio experience.

Table 1. Richard Miller's seven common consonant-related errors in singing.⁵³

Prolonged consonants.	<ul style="list-style-type: none"> • Prolonged nasal consonants hinder legato. • Prolonged pitch consonants in attempt to project the voice result in exaggeration, pretentiousness, and “parodistic language sounds.”
Separation of consonant and vowel in the onset.	<ul style="list-style-type: none"> • Audible separation of an initial consonant and vowel in attempt to clarify diction in a large hall interrupts the flow of tone. • Disrupts breath coordination. • “Produces a grotesque parody of diction.”
The quickly occurring consonant.	<ul style="list-style-type: none"> • Techniques that feature a low jaw, wide pharynx, or tensed tongue do not allow flexibility at the front of the tongue for quick, crisp articulation.
The diminishing vowel sound.	<ul style="list-style-type: none"> • Legato requires singers to sustain the intensity of the vowel as it approaches a consonant. • Language habits and speech inflection often causes fluctuating intensity in singing.
The modified vowel sound.	<ul style="list-style-type: none"> • Consonants may influence the color of the vowel that precedes it. • There is a greater risk of “transition sounds” (<i>on-glides</i> and <i>off-glides</i>) when singing in one’s native tongue. • The ear perceives sung transition sounds (generally slower than spoken transition sounds) as an “alteration of vocal timbre” and “interruption of legato.”
Dynamic fluctuation (intensity) in diphthongization.	<ul style="list-style-type: none"> • Diphthongs sometimes classified as semi-consonants (e.g. /w, j/ and /ɪ/) can “wreak havoc” on legato if the “vanishing” vowel,

⁵² Miller, *On the Art of Singing*, 20.

⁵³ Ibid., 20-25.

	such as the final /u/ sound found in the /w/ of “how,” loses vibratory or dynamic intensity.
Phrase inflection.	<ul style="list-style-type: none"> • Consonants may interrupt the forward momentum of legato if phrase inflections result in dramatic dynamic fluctuation. • “The contour of no single phrase should be at the mercy of uneven tonal intensity.”

21st Century

Since Miller’s publication, pedagogical uses of consonants have become common practice in many teaching studios. In addition to voiced consonants, lip and tongue trills have proven to be useful tools for encouraging vocal fold adduction, blended registers, regulated airflow, and balanced resonance. Current research supports the inclusion of **semioccluded vocal tract exercises**. Leading voice scientist Ingo R. Titze found that semioclusion in the vocal tract, whether it be at the lips or the epiglottis, results in a favorable “push and pull”⁵⁴ on the tissue surfaces of the vocal folds as well as balanced air pressures above and below the folds. A nonoccluded vocal tract, as in the open vowels /a/ and /ɔ/, results in strong pressure below the folds.

Lawrence R. Indik proposed using voiced consonants to relieve tension in vowel production. A tense vowel may be characterized as having “higher than optimal impedance”⁵⁵ in the vocal tract. Indik claimed voiced consonants (e.g., /v/) magnify vocal tract impedance, therefore, they could be used to bring vowel tension into the student’s awareness. “The singer senses the stress and can reduce the discomfort by altering the shape and tensions of the vocal tract ... When the particular constriction of the consonant

⁵⁴ Ingo R. Titze, “One More Small Step in Solving the Mystery of the Benefits of Semioccluded Vocal Tract Exercises,” *Journal of Singing* 69, no. 3 (January/February 2013), 305-6.

⁵⁵ Lawrence R. Indik, “Consonant Feedback in Singing,” *Journal of Singing* 57, no. 4 (March/April 2001), 19.

is removed and the vowel sound isolated, the new, still recognizable, vowel is freer.”⁵⁶

Leslie De’Ath, Associate Editor of the *Journal of Singing*, contributed numerous articles that draw from linguistic studies to determine best practices for lyric diction. He recognized that applied practices of diction in music remain about fifty years behind linguistic science. Most introductory literature for lyric diction opts for simplistic nomenclature. “There are, however, certain allophonic distinctions that are crucial for singing.”⁵⁷ For example, in standard lyric diction for English, the symbol [t] refers to the unaspirated alveolar stop as in the word "stand." Other possible allophones of /t/ are:

[t]	dental	“eighth”
[t ^h]	aspirated	“tip”
[t ^w]	lip-rounded	“too”
[t ^l]	lateral-release	“little”
[t ⁿ]	nasal release	“whatnot”
[t̚]	unreleased	“hit” (North American)
[ʔ]	glottal stop	“button” ⁵⁸

It is “not always advisable to convey every minutia of articulative detail” because the transcription becomes “visually cumbersome.”⁵⁹ For some singers, even simplified transcriptions of IPA can “introduce another level of complexity in an already complex discipline.”⁶⁰ However, responsible vocal pedagogues should work toward achieving a firm grasp of the exact manner of articulating sounds so that they can accurately monitor and address the articulatory habits of their students.

A survey of major publications in the field of vocal pedagogy between 1840 and

⁵⁶ Lawrence R. Indik, “Consonant Feedback in Singing,” *Journal of Singing* 57, no. 4 (March/April 2001), 19.

⁵⁷ Leslie De’Ath, “The Merits and Perils of the IPA for Singing,” *Journal Of Singing* 57, no. 4 (March/April 2007), 59.

⁵⁸ Ibid., 59.

⁵⁹ Ibid.

⁶⁰ Ibid., 64.

2014 revealed an evolution in the way consonant articulation was addressed in solo voice training. Garcia, his predecessors, and his contemporaries recognized consonants as essential elements of expression posed as technical obstacles. Marchesi emphasized a progressive teaching method that focused on vowel production initially, and then incorporated consonants in vocalises before finally advancing to repertoire. Stockhausen believed consonant production should be studied in conjunction with vowels from the beginning of singing instruction. Miller was the first and most influential pedagogue to write in detail about consonants as pedagogical tools rather than only as technical challenges that needed to be overcome. Since Miller's text, teaching resonance balancing and register blending via consonants has become widespread in private studio teaching. Current research, led by Titze, Nix, Simpson, and Indik among others, validates this practice with scientific evidence and also clarifies the procedures for effective teaching.

A recent trend in voice science is that of sung text intelligibility. This area of research is motivated by fact that intelligibility is highly correlated to listeners' enjoyment of solo and choral singing.⁶¹ Researchers such as Johan Sundberg, Jane Ginsborg, Andrea Deme, Lauren Collister, Nicole Scotto Di Carlo, Sten Ternström, and J.S. Bradley have contributed studies (see Bibliography) that attempt to identify factors that affect intelligibility such as the presence of singer's formant, high registration, consonant confusions, and vowel modifications. Their findings provide scientific and empirical evidence of the need for improved pedagogy that enhances singers' diction in both solo and choral settings.

⁶¹ Philip A. Fine and Jane Ginsborg, "Making Myself Understood: Perceived Factors Affecting the Intelligibility of Sung Text," *Frontiers in Psychology* (September 2014): 1-21, accessed December 11, 2014, <http://journal.frontiersin.org/article/10.3389/fpsyg.2014.00809/abstract>.

CHAPTER 2: REVIEW OF CHORAL PEDAGOGY LITERATURE

Choral pedagogy is a complex and multifaceted practice that demands methodologies for teaching music literacy, aural skills, vocal technique, languages, lyric diction, music history, and performance practice. The vast array of topics under the choral arts umbrella has divided the attention of directors and authors. As a result, the topic of consonant articulation typically appeared in choral sources as a subsidiary issue under the subject of diction (with diction falling under the even broader subject of vocal technique).

An analysis of over 950 publications between 1930 and 1970 revealed that the majority of choral pedagogues focused on building choral tone through vowel production.¹ The school of thought that denied the importance of consonants was firmly articulated by Noble Cain: "... the vowel is the ONLY vehicle for tone ... each word in every language has a tone and a noise. Each syllable of each word has a tone and a noise! The tone is the vowel; the noise is the consonant!"²

Waring

In direct opposition to this viewpoint, Fred Waring championed a phonetic system of choral diction. While he and his group, The Pennsylvanians, specialized in popular music styles, their approach to diction greatly impacted choral training in America. His method of enunciation, the Tone Syllable method, focused on delineating the simplest units of every word so that each could be sounded with complete attention. He said, "no

¹ Gerald F. Darrow, *Four Decades of Choral Training* (Metuchen, NJ: Scarecrow Press, 1975).

² Noble Cain, *Choral Music and Its Practice* (New York, NY: M. Witmark and Sons, 1932), 39-42.

language in the world has more beautiful sounds than ours—if we sing them. We sing all the beauty of all the sounds of all the syllables of all the words.”³

Waring preferred to demonstrate the concepts of his method via workshop sessions, which he gave over a thirty-seven year span, but the widely distributed *Tone Syllables*⁴ pamphlet summarized his approach to consonants.⁵ He encouraged intensification and lengthening of voiced consonants, especially the continuants /l, m, n, ŋ/ and /r/ in order to enhance diction. He argued that proper articulation of those consonants left sufficient space in the vocal tract and did not disturb freedom of tone production.

He gave high priority to the **rhythmic unification** of consonants. Final consonants of syllables were often pronounced as initial sounds of the following syllable (yet timed so that the vowel sounded clearly on the beat). Consonant clusters and stressed individual consonants were given a “proportionate rhythmic amount of the full time value” which often meant vowels were shortened to make room for consonants (Figure 1).⁶

³ Fred Waring, “Fred Waring Music Workshop session,” tape recording, Waring collection, 1966, quoted in Fritz Mountford, “Fred Waring's Tone Syllables: His Legacy to American Choral Singing,” *The Choral Journal* 41, no. 1 (August 2000): 10.

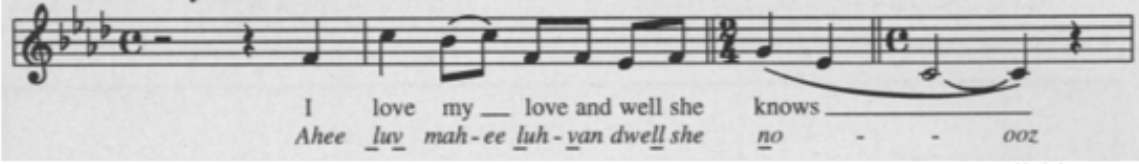
⁴ Fred Waring, *Tone Syllables* (Delaware Water Gap, PA: Shawnee Press, Inc., 1945).

⁵ Admitting to a lack of formal study in phonetics, Waring was reluctant to codify his method. The *Tone Syllables* pamphlet attributed to him was actually written by Lara Hoggard and Marjorie Farmer. He maintained that his method was not conceived as a strict system but rather a conceptual approach guided by the director’s sense of mood, meaning, and tone. He urged: “Analyze, work it out your own way, decide for yourself; every problem is its own, the “rules” are not a cure-all.”

⁶ Waring, *Tone Syllables*.

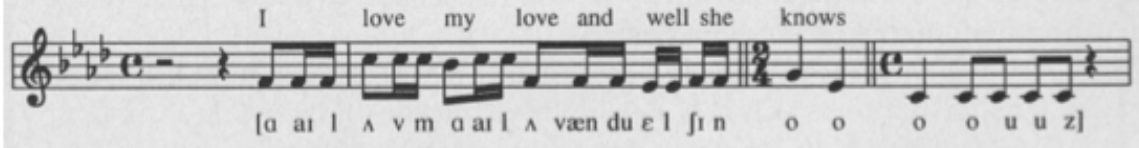
Figure 1. Examples of Fred Waring's Tone Syllables.⁷

Moderately slow



I love my love and well she knows
 Ahee luv mah-ee luh-van dwell she no - - ooz

Folk song excerpt. Traditional notation and text with typical Tone Syllables underlay. Visual symbols are an incomplete and often misleading representation of Waring's aural concepts.



I love my love and well she knows
 [a ai l A v m a ai l A vaen du e l fi n o o o o u u z]

The excerpt notated to demonstrate the intended proportional rhythm of "all the beauty of all the sounds of all the syllables" in Waring's method.

Shaw

Waring's most renowned descendent, Robert Shaw, was highly influenced by the Tone Syllables method. Waring launched Shaw's career by appointing him to direct a professional men's glee club composed of members from Waring's Pennsylvanians.⁸ The following quotes by Shaw reiterate the ideas established by Waring:

"We are obliged to sing (to phonate on pitch wherever possible) not words, but every sound of every word."⁹

"Meld words together; tie final consonants across to the next word. Leave us have no solo sibilants"¹⁰

"Exaggerate the duration and loudness of consonants having pitch: like M's, N's, NG's, L's, B's, G's, D's and J's."¹¹

⁷ Fritz Mountford, "Fred Waring's Tone Syllables: His Legacy to American Choral Singing" *The Choral Journal* 41, no. 1 (August 2000): 11.

⁸ Ibid., 10.

⁹ Robert Shaw, *The Robert Shaw Reader*, ed. Robert Blocker (New Haven, CT: Yale University Press, 2004), 117.

¹⁰ Ibid., 12.

¹¹ Ibid.

Following Waring's technique, which assigned each phoneme a proportional rhythmic value, Shaw said, "Love the sound of words, but this must not destroy the pulse of the music or the speed and shape of the phrase. For no matter what sounds of speech are prescribed, the principal sound of any syllable must coincide exactly with the rhythmic pulse in the music."¹²

In addition to these precepts, Shaw advocated inserting neutral vowels after and between plosive consonants to improve their audibility.¹³ This technique was largely a result of his concentration on symphonic choral repertoire. He recognized that plosive consonants were "substantially *inaudible* when sung against the sonic capacities of a symphony orchestra."¹⁴ Neutral vowels helped to project the explosion of consonants, increasing their dynamic to match the level of a principal vowel. Additionally, if the neutral vowel was given a rhythmic proportion of the syllable—as short as possible as long as it remains perceptible¹⁵—it might also "augment metric and rhythmic interest."¹⁶ An example of using a neutral vowel to project the /k/ in "break forth" and to separate the consonants /k/ and /f/ is shown in Figure 2.

¹² Robert Shaw, quoted in Howard Swan, "The Development of a Choral Instrument," Harold A. Decker and Julius Herford, *Choral Conducting: A Symposium* (Englewood Cliffs, NJ: Prentice Hall, 1988), 36.

¹³ Shaw, *Shaw Reader*, 117. Neutral vowels are also referred to as "vanishing vowels," "disappearing vowels," and "shadow vowels" in choral technique. Shaw learned this principle from Madelaine Marshall, a lyric diction instructor at the Julliard School of music.

¹⁴ Ibid.

¹⁵ Ibid., 103.

¹⁶ Ibid., 117.

Figure 2. Shaw example of using a neutral vowel to improve consonant enunciation.¹⁷



Shaw's respect for Waring's work is summed up in this quote: "It was [Waring] who first demonstrated on a national scale, and to the average listener's satisfaction, that choruses could, in fact, enunciate—could be understood."¹⁸ He ultimately transcended Waring's method, varying his rehearsal techniques according to the demands of a given score. Regardless of the repertoire, his mode of procedure typically involved isolating the components of music, text, rhythm, dynamics, intonation, balance, etc., working on "one element at a time" with severe deliberation, and then joining them together to form a beautiful and cohesive whole.¹⁹

He put great emphasis on rehearsal procedures for the study of repertoire, and less emphasis on warm-up procedures for building tone. He said, "Choral disciplines (intonation, color, dynamics, rhythm and articulation) are good for something. – But that something is else. They are means and servants, not ends and masters."²⁰ He did not think choral warm-ups should be treated as group voice lessons. He noted, "Voices are as unique as the people they inhabit. What's effective for one person may be a waste of time or possibly even injurious to another. Only the skilled teacher, working privately over a considerable period of time, is in a position to build or aid an effective vocal

¹⁷ Shaw, *Shaw Reader*, 103.

¹⁸ Robert Shaw to Hilda Cole, June 11, 1981, Waring Collection, Atlanta, GA.

¹⁹ Shaw, *Shaw Reader*, xi.

²⁰ *Ibid.*, 60.

technique.”²¹ Consequently, Shaw used warm-up exercises to prepare the chorus for the vocal, musical, and mental demands of the rehearsal. He said, “The Warm-Up does not build the chorus. *Mrs. Solemnis* does.”²² (To that point, one could justly replace Beethoven’s *Missa Solemnis* with Bach’s *B Minor Mass*, Mendelssohn’s *Elias*, Brahms’ *Ein deutsches Requiem*, Haydn’s *The Creation*, etc.)

Ehmann, Haasemann, and Jordan

Another school of thought, represented by William Ehmann, Frauke Haasemann, and James Jordan, emphasized the pedagogical value of the warm-up period. Ehmann and Haasemann were celebrated specialists in group vocal technique who believed healthy choral tone should be developed through warm-up exercises. They produced *Voice Building for Choirs* (1982), a handbook for choral singing. It became popular among amateur choirs in America because its wealth of exercises addressed a wide range of topics (e.g. “to create a steady expulsion and use of air,” “to encourage consistency in the vocal registers,” “relaxation of the tongue,” etc.). They cautioned readers against regarding their text as a comprehensive set of exercises for progressive study (although many of their exercises are grouped in progressive sets).²³ Their intention was to demonstrate ways in which the director could creatively engage their singers’ imaginations and connect vocal technique to everyday-life occurrences. Consonants were used judiciously and for different purposes throughout the text.

²¹ Shaw, *Shaw Reader*, 60.

²² *Ibid.*, 61.

²³ William Ehmann and Frauke Haasemann, *Voice Building for Choirs*, trans. Brenda Smith, revised edition (Chapel Hill, NC: Hinshaw Music, Inc., 1982), viii.

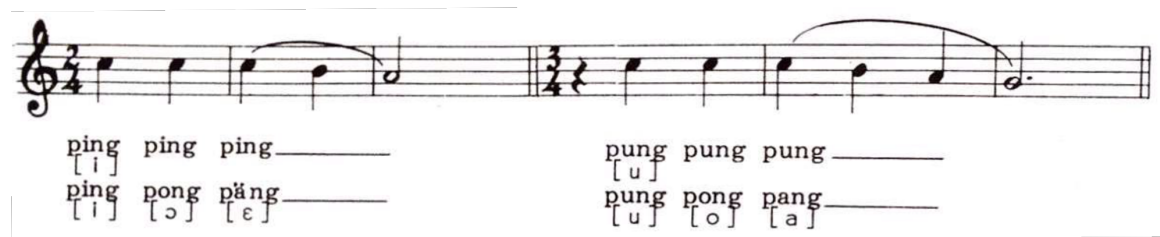
Nasal continuants were emphasized as useful aids for resonance development.²⁴

The following exercise was suggested for “tonal placement”:

Buzzing bees: Bees buzz with [n], [m], or [ŋ]. [n] is used for nasal resonance, [m] for mouth resonance and [ŋ] for head resonance. Imagine the bees caught in the nose, creeping into the head. Follow their wanderings with a hand.²⁵

Once an awareness of vibratory sensations in the “mask” was established, the nasal continuants were combined with vowels. (Because the original text was written for German choirs, mixed vowels such as *ü*, *ä*, and *ö* appear unaltered throughout the English translation.²⁶)

Figure 3. Ehmann and Haasemann exercise using nasal continuants for register blending and resonance development.²⁷



In the exercise above (Figure 3), bilabial plosive /p/ was used to direct airflow and tone forward. The vowels were meant to be as short as possible so the /ŋ/ could be sustained. Using the “gliding motion of /ŋ/” to “carry the head resonance into the lower registers” also helped to develop consistency of tone between registers.²⁸ The next phase of the exercise involved “[dropping] the /ŋ/ intermittently to check the placement of the

²⁴ A continuant is a consonant produced with an incomplete closure which allows air to continue such as in fricatives or approximants. In the case of nasal continuants /m, n/ and /ŋ/, the lowered velum allows air and sound to pass through the nose.

²⁵ Ehmann and Haasemann, *Voice Building for Choirs*, 11.

²⁶ William Ehmann and Frauke Haasemann, *Handbuch der chorischen Stimmbildung* (Kassel: Bärenreiter, 1984).

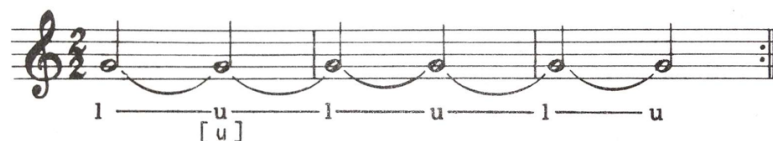
²⁷ Ehmann and Haasemann, *Voice Building for Choirs*, 12.

²⁸ Ibid., 11.

vowels.”²⁹ The approach complied with Miller’s instructions for resonance balancing on nasal continuants. Using nostril occlusion as suggested by Miller would improve upon these exercises and help to guard against nasality in the vowels.

Other voiced continuants were used similarly in later chapters. /l/ was used as a model consonant that established precise placement of the tip of the tongue behind the upper teeth (more forward and relaxed than the American /l/). First, /l/ was given a duration equal to the /u/ vowel (Figure 4.1). Once an awareness of tongue action, breath action, and the resonance of both consonant and vowel was established, the /l/ was substituted with other consonants (Figure 4.2). The next step united the consonant with the vowel to form a single syllable, as it would be executed in texted music (Figure 4.3). The consonant was notated with a grace note, a “phonetic appoggiatura,” clarifying that the consonant should precede the beat and phonate on the pitch of the primary vowel.³⁰ Lastly, the forward vowels, /y/ and /e/, were incorporated to reinforce high vibratory sensations (Figure 4.4).

Figure 4.1. Ehmann and Haasemann exercise for /l/ and /u/.³¹



²⁹ Ehmann and Haasemann, *Voice Building for Choirs*, 12.

³⁰ Shaw, *Shaw Reader*, 101.

³¹ Figures 4.1-4.4 found in William Ehmann and Frauke Haasemann, *Voice Building for Choirs*, trans. Brenda Smith, revised edition (Chapel Hill, NC: Hinshaw Music, Inc., 1982), 30-31.

Figure 4.2. Ehmann and Haasemann exercise for continuants and /u/.

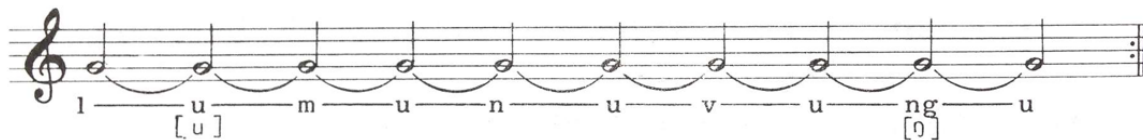


Figure 4.3. Ehmann and Haasemann exercise for consonants, /u/, and forward vowels with grace note consonants.



Figure 4.4. Ehmann and Haasemann exercises for mixed vowels and /l/.



After progressing through this set of exercises, they were to be repeated using other syllables to “apply the sensation of forward placement to other vowels.”³² The set demonstrates a logical sequence of drills that gradually merge consonant and vowel production while also developing consistency in resonance. Other sections of the text were less pedagogically sound. An example of this can be found in their approach to breath management.

³² Ehmann and Haasemann, *Voice Building for Choirs*, 31.

The authors employed plosive consonants and fricatives in breath management exercises; however, much of their advice was rooted in poor technique. One of their exercises for “relaxation of the diaphragm” appeared with the following instructions:

With the tongue wagging out of the mouth, pant like a dog after a long, hot walk. Begin in a slow tempo and steadily increase momentum. Place a hand on the abdomen to feel the diaphragmatic response ... Using the same panting action, speak the following consonants: [h] [f]. Then substitute diaphragm pushes for the panting and speak:

[p] [t] [k]
[f] [s] [tʃ]
[r] [br]³³

Not only was the topic heading misleading—the exercises vigorously engaged abdominal muscles instead of relaxing the diaphragm—but also, they encouraged outward “pushes” in the abdominal wall.

Techniques such as these were based on the following premise: “Most functions in choral singing are based upon exaggeration; that is, the subtleties which a solo singer would employ must be multiplied by the entire group ... For example, the degree of choral articulation is double that required for the articulation of solo works.”³⁴ While it may be true that choral articulation demands increased intensity and duration of certain consonants, exaggeration is likely to create unwanted tension.

Many of the techniques found in *Voice Building for Choirs* were revised and updated through the work of James Jordan. Jordan began working closely with Ehmann and Haasemann at Westminster Choir College in 1978. He co-authored *Group Vocal Technique* (1991) with Haasemann. The book, along with its companion video and exercise flash cards, reorganized the techniques found in *Voice Building for Choirs* and

³³ Ehmann and Haasemann, *Voice Building for Choirs*, 27.

³⁴ *Ibid.*, x.

clarified the instructions to make them more accessible. The value of *Group Vocal Technique* lies in its practical presentation of concepts. Every concept discussed (e.g. “relaxation of the tongue,” “the development of head tone,” “sensing the support necessary for legato,” etc.) is augmented with exercises that target development of a skill. The exercises are given in a progressive sequence, akin to the sequenced exercises in Miller’s *The Structure of Singing*. They avoided technical descriptions and favored exercises based on activities taken from daily life because these formed a “pedagogical bridge from theory to practice.”³⁵

Haasemann and Jordan improved the Ehmann/Haasemann approach to teaching breath management by putting more onus on the director. They instructed:

“Listen carefully to the intensity and speed of the air that the choir is expelling. In all cases, the choir should be *matching* the director’s model. If the director detects that the choir is not performing the exercise with the proper breath intensity and speed, then he should make adjustments as soon as possible to gain the desired response.”³⁶

The unvoiced consonant exercises (see pg. 31) were used to initiate diaphragmatic activity. They cautioned against confusing the activity with the sensation of sustained support. To develop support necessary for singing, they assigned long exhalation exercises. “Hissing on an “s,” and “f” or a “sh” sound for 4, 6, 8, 10, 12, etc., counts can teach the sustained air flow sensation ... Very often vocal tone problems have their roots in a lack of consistent airflow in *legato* music.”³⁷ They identified rhythm as the force most disruptive to consistent airflow. “Musical rhythm should never be initiated by the breath. *Rhythm is produced through diction and articulation, not by diaphragmatic*

³⁵ Frauke Haasemann and James Mark Jordan, *Group Vocal Technique* (Chapel Hill, N.C.: Hinshaw Music, 1991), 67.

³⁶ Ibid., 51.

³⁷ Ibid., 54.

activity.”³⁸ In order to apply the skills to repertoire, the following steps were given:

1. Choose a sentence from a choral piece the choir is currently preparing. Write only the vowel sounds on the chalkboard and chant them in a middle range.
2. Then, repeat the chant but put a voiced consonant in front of each one such as “n,” “m,” or “l.” As the choir members sing, they can take an imaginary rubber band in their hands and pull it slowly outwards. This image will help the support.
3. Write the consonants of the melody on the chalkboard and speak them with diaphragm activity and *staccato*.
4. Chant the entire text with long-sounding vowels and crisp, short, voiced consonants.
5. Finally, sing the original melody.³⁹

In subsequent chapters, Haasemann and Jordan’s instructions for consonant production contradicted some of their statements regarding breath support. They wrote, “If the conductor cannot understand the text, he should write only the consonants on the blackboard and let the singers pronounce them vigorously with diaphragm pushes under each consonant.”⁴⁰ In their exercises for “teaching *martellato*” (Figure 5), they promoted “strong diaphragmatic pushes” on the consonant /d/, an action that creates tension in the breathing mechanism, jaw, and voice.⁴¹ As the choir progressed through each exercise, the tempo quickened and the /d/ consonants were dropped. Haasemann and Jordan asked singers to maintain diaphragm pushes and jaw movement where the /d/ consonants were omitted. Under the final exercise, they wrote, “When arriving at the desired tempo for performance, a slight ‘jaw trembling’ is left over from the beginning large jaw movement. Remember that the ‘jaw trembling’ should be a manifestation of a relaxed jaw.”⁴² In actuality, perceived jaw trembling is typically a sign of muscular tension.

³⁸ Haasemann and Jordan, *Group Vocal Technique*, 54.

³⁹ Ibid., 96-97.

⁴⁰ Ibid., 110.

⁴¹ Ibid., 101.

⁴² Ibid.

Figure 5. Haasemann and Jordan exercises for teaching *martellato*.⁴³



Jordan eventually authored his own text, *The Choral Warm-Up* (2004), which reformed many of the concepts presented in the Haasemann books. He admitted to their misuse of the term “diaphragm activity” in previous publications, concluding that the approach “created more problems than it solved.”⁴⁴ Additionally, repeated unvoiced consonant exercises, e.g. “f-f-f-f-s-s-s-s,” did little to develop breath management for singing. The following issues were noted:

- The sensation of repeated sibilants without sung sound is not the sensation one feels when air is released from the body through the vocal chords and transformed into vocal sound.
- The constant release of air tends to dry the vocal cords [*sic*], possibly leading to vocal problems.
- The repeated use of sibilated consonants causes the larynx to raise into a higher position and, thus, works in opposition to principles presented earlier for healthy vocal singing.

⁴³ Haasemann and Jordan, *Group Vocal Technique*, 100-1.

⁴⁴ James Jordan and Marilyn Shenenberger. *Evoking Sound: The Choral Warm-Up : Method, Procedures, Planning, and Core Vocal Exercises* (Chicago: GIA Publications, 2005), 71.

- The repeated use of such sibilants can also produce jaw, tongue, and lip tension.⁴⁵

Jordan recognized a need for specific teaching techniques that helped choirs successfully navigate **the transition from spoken diction to sung diction**. He observed, “The choral profession has generally embraced the philosophy that all one needs to do is to ‘speak the text after me.’”⁴⁶ This approach does not give enough time and instruction to the myriad of phonetic obstacles that impact sung sounds. Speech habits subvert good vocal technique, especially in less experienced singers. Jordan offered a “six-step diction teaching technique” as a safeguard:

1. **Correct Speech.** Speak the text correctly ... in the rhythm of the piece ...
2. **Sustained Speech.** Speak the text ... out of the rhythm of the piece in a slow, sustained style that is still spacious, high, and forward ...
3. **Heightened Exaggerated Speech** ... speak the text in a heightened, spacious, exaggerated style, almost imitating an exaggerated, spacious British accent ...
4. **Staccato Singing on Text** ... sing the piece on the text, but sing everything shortened or quasi-staccato ... By singing staccato, singers are forced to commit to the correct vowel on the attack ... the break or air space between each pitch allows the choir time to **hear** the next pitch and the next vowel, thus ensuring more accurate pitch and rhythm ... This procedure also ensures that there is a quick and efficient change between and among all vowel sounds and that consonants are handled with quick dispatch.
5. **Voweling** ... sing vowel sounds only without consonants ... This technique further refines the necessary skill of quickly and efficiently changing vowel sounds ...
6. **Whole-Tone Chordal Singing.** This technique was a favorite of the late Robert Shaw. Using this technique, build a chord of four whole tones, each tone being assigned to a different voice part in the choir. Have the choir chant the rhythm of the piece you are rehearsing on the whole-tone chord. If the chord goes out of tune or changes color, then the only responsible culprit is the vowel ...⁴⁷

⁴⁵ James Jordan and Marilyn Shenenberger. *Evoking Sound: The Choral Warm-Up : Method, Procedures, Planning, and Core Vocal Exercises* (Chicago: GIA Publications, 2005), 71.

⁴⁶ Ibid., 102.

⁴⁷ Jordan, *The Choral Warm-Up*, 104-5.

These techniques allowed consonant production to develop slowly in concordance with vowel production. Potential issues such as the rhythmic placement of consonants were identified in the speech and “heightened speech” phases.

Jordan believed consonants for vocalization should be chosen with careful thought to their “pedagogical imperative.”⁴⁸ He discussed the advantages and disadvantages of nine frequently used consonants. He created a hierarchical order for those consonants because he believed some (/d, n, v/) should be used more frequently than others (/t, m, p/). Interestingly, he classified /l/ as a consonant that should be avoided if possible because he claimed the tenseness and darkness of the American /l/ as pronounced in “milk” was too problematic for voice building. This opposed Miller’s view that /l/ should be used as a keystone consonant to acquire efficient tongue action. Jordan’s observations are summarized in Table 2.

Table 2. James Jordan list of advantages and disadvantages of specific consonants used in vocalization.⁴⁹

	Hierarchical Rank	Advantages	Disadvantage
/d/	First choice	<ul style="list-style-type: none"> • Efficient use of breath support • Encourages natural high, forward resonance • Encourages singers to “stay on the breath” • Useful for <i>marcato</i> articulation 	

⁴⁸ Jordan, *The Choral Warm-Up*, 84.

⁴⁹ Ibid., 84-5.

	Hierarchical Rank	Advantages	Disadvantage
/n/	First choice	<ul style="list-style-type: none"> • Useful for <i>legato</i> articulation • Encourages proper support • Trains accurate pitch production • Encourages high, forward resonance 	
/v/	First choice	<ul style="list-style-type: none"> • Encourages high, forward resonance • Encourages proper breath support 	
/t/	Second choice	<ul style="list-style-type: none"> • Useful for detached articulation or rhythmic clarity 	<ul style="list-style-type: none"> • Uses more air than voiced consonant or vowel • Repeated use “makes it difficult to keep vocal sound on the breath and supported”
/m/	Second choice	<ul style="list-style-type: none"> • Useful for <i>legato</i> articulation • Trains accurate pitch production 	<ul style="list-style-type: none"> • Can cause lip tension and clenched teeth • “backward placement” of tone that is not high and forward
/p/	Third choice	<ul style="list-style-type: none"> • Lightens vocal production or choral texture when it sounds “heavy” or “thick” 	
/l/	“Consonants to never use”		<ul style="list-style-type: none"> • American /l/ produces throaty, unfocused vowels
/j/	“Consonants to never use”	<ul style="list-style-type: none"> • May be used for jaw relaxation 	<ul style="list-style-type: none"> • Difficult to maintain high, forward resonance
/r/	“Consonants to never use”		<ul style="list-style-type: none"> • Difficult to maintain high, forward resonance • American reflexive /r/ causes tongue tension

As a result of his hierarchical groupings of consonants, Jordan’s 24 Core Vocal Exercises only utilized consonants from the first tier: /d, n/ and /v/. Vowels were limited to /i, u, o/ and /a/. The narrow range of phonemes may have been appropriate to Jordan’s target audience—the amateur chorus whose members lack private singing instruction.

Yet, troublesome consonants inevitably appear in repertoire for all levels of singing. The technique needed to overcome those challenges remains incomplete without a more thorough training method. Intermediate and advanced exercises geared toward more accomplished collegiate singers are needed to address the complex spectrum of phonemes.

Emmons and Chase

An informative discussion regarding the challenges of choral diction can be found in Shirlee Emmons and Constance Chase's *Prescriptions for Choral Excellence* (2006). Their conclusions are strongly based on the work of noted voice scientists (including Appelman, Vennard, Coffin, Miller, Johan Sundberg, and Titze) as well as their own experiences as vocal and choral pedagogues. Solutions to common vocal problems were proposed as "prescriptions" that included practical rehearsal techniques and vocal exercises.

Emmons and Chase stated: "Singing is a paradoxical enterprise ... It can flourish only when beautiful sounds issue from the singer's throat, but most of the time those beautiful sounds must be accompanied by an illumination of the meaning behind the sounds."⁵⁰ Consonants, regarded as the "backbone of text clarity," disturbed the flow of beautiful sounds by closing the mouth, tensing the tongue, and stopping the airflow.⁵¹

In order to overcome these challenges, they believed consonant production needed direct instruction. It was not enough to rely on spoken consonants to develop sung consonants, as Jordan previously stated. They claimed, "The enunciation and

⁵⁰ Shirlee Emmons and Constance Chase, *Prescriptions for Choral Excellence: Tone, Text, Dynamic Leadership* (Oxford: Oxford University Press, 2006), 76.

⁵¹ *Ibid.*, 77.

pronunciation of consonants is not covered by simply asking for good speech habits.”⁵²

Furthermore, while the use of IPA was encouraged, they found that the symbols did little to help vocal production. They noted, “Even if singers have learned the IPA symbols for consonants in the singing languages, they have learned only the proper pronunciation ... correct IPA symbols for consonants are perhaps of less use in the rehearsal setting than is the **instruction and training of their proper execution** [emphasis mine].”⁵³

To construct a pedagogical plan for the development of proper consonant execution, the authors began by identifying potential vocal faults associated with poor execution. Most faults were attributed to exaggerated consonant production, which they referred to as the “spitting out of consonants.”⁵⁴ Exaggerated consonants were likely to produce tongue tension, fatigue, jaw tension, unnecessary subglottal pressure, and unnecessary mouth closure. Conductors and choristers that resort to exaggerated consonants often confuse speech noise with clear articulation. Emmons and Chase found that the increased subglottal pressure of exaggerated plosive consonants “created more peripheral noise, which had the effect of masking the real sound of the consonant.”⁵⁵ Thus, their prescriptions concentrated on practicing the ‘real sounds of consonants’ through articulatory and rhythmic precision rather than excessive projection.

They recommended focusing on alveolar consonants /t, d, n, l/ and /r/. “... There are more consonants needing tongue activity for clarity than there are those that close the mouth and use lips, teeth and bottom lip, and so on. Therefore, closing the mouth is often

⁵² Emmons and Chase, *Prescriptions for Choral Excellence*, 78.

⁵³ Ibid.

⁵⁴ Ibid., 79.

⁵⁵ Ibid.

not efficient.”⁵⁶ The aforementioned consonants require minimal mouth closure and lip movement, which allowed singers to focus on precise movements of the tip of the tongue—from its relaxed state behind the lower teeth, to its contact point on the alveolar ridge. They suggest using an open-mouth vowel such as /a/ because it enables the teacher to monitor the choir’s skill in isolating tongue movements without disturbing the relaxed, lowered jaw.

A common fault occurs when transition sounds between phonemes cause vowels to be distorted—**vowel contamination**.⁵⁷ This is often a result of lethargic movement in one of the articulators. It can be addressed by training rapid and precise movement of the articulators, and preparing the vocal tract for the imminent vowel can also help to prevent the fault. Emmons and Chase suggested, “When starting a phrase with a word that begins with a consonant, do not prepare the consonant. Instead, prepare the vowel position with the mouth, then inhale, with the mouth position still faithful to the vowel.”⁵⁸ To put it simply, one should breathe on the vowel to be sung even if a consonant precedes it.

Emmons and Chase believed conductors should be aware of the necessity for vowel modification in high tessitura, paying close attention to the jaw opening sizes of their singers. In general, higher pitches lead to larger jaw openings which in turn make consonants more difficult to produce. While many authors from both vocal and choral disciplines spoke to the need to forfeit consonants in those scenarios, their arguments

⁵⁶ Emmons and Chase, *Prescriptions for Choral Excellence*, 79.

⁵⁷ This term is mine, but the idea came from Kathryn Labouff’s statement: “If the tongue pulls back in anticipation of the /l/, the preceding vowel becomes contaminated . . .” from Kathryn Labouff, *Singing and Communicating English: A Singer’s Guide to English Diction* (New York, NY: Oxford University Press, 2008), 181.

⁵⁸ Emmons and Chase, *Prescriptions for Choral Excellence*, 84.

were posed as merely vocal solutions. Emmons and Chase gave artistic validity to the prioritization of tone and vowel with this argument:

“For the most part, on extremely high notes one has an option: to be understood or to make a beautiful sound. In truth, in a moment defined by a very high note, the word scarcely matters to the listener. The sheer sound of the vocal tone itself carries that moment. Furthermore, it is the composer who must anticipate the problem that will be caused by a word that has been written on the high note. If the composer is well versed in writing for the voice, he or she will emulate Mozart and Verdi, repeating that word many times on lower pitches before setting the word on a high note, reserving the high note for tone, not import. This will free the singer to make a glorious tone instead of a clear word.”⁵⁹

If a conductor has concluded that the musical and vocal demands of a particular phrase justify the modification of a consonant, the consonant may be partially executed. The authors recommended the following:

For partial execution of ...

- bilabial consonants /p, b, m/, “do not let the lips touch; just go part way to closure.”
- affricates /tʃ, dʒ/, remove the initial plosive. /tʃ/ will default to /ʃ/ and /dʒ/ will default to /ʒ/.
- alveolar consonants /t, d, n, l, r/, “do not let the tongue actually touch the palate; just start the gesture without finishing it.”
- hissing sibilants /s/ and /z/, “don’t shut the jaw all the way; just go in the right direction part way, but swiftly. This will produce a slight lisp, a matter of no importance.”
- labio-dental consonants /f, v/, “don’t allow the teeth to actually touch the bottom lip; just approach it, and leave.”⁶⁰

Emmons and Chase cautioned that the consonant modification techniques employed above should be reserved for higher voices (sopranos and tenors). Their execution required complete rhythmic unanimity, therefore, singers must be trained to perform any modified consonant quickly and precisely on beat. The lower voices (altos and basses) should be held responsible for clear, accurate enunciation of the consonants.

⁵⁹ Emmons and Chase, *Prescriptions for Choral Excellence*, 83.

⁶⁰ *Ibid.*, 89.

For the greater part of the 20th century, vocal training in choral practice lagged behind advances made in solo voice training. Recently, the gap between solo voice pedagogy and choral voice pedagogy has narrowed as both sides began working more cooperatively in institutions and publications. Within the past five years, practitioners from both fields have crossed barriers in the major periodicals for vocal and choral arts. In 2011 and 2012, a series titled “The Choir Issue” appeared in the *Journal of Singing*,⁶¹ the official journal of the National Association of Teachers of Singing. In 2012, a series titled “Choral Directors are from Mars and Voice Teachers are from Venus” began in the *Choral Journal*,⁶² the official journal for the American Choral Directors Association. Both parties have demonstrated a willingness to reconcile differences, but there is work yet to be done, especially for conductors who tend to be less informed regarding best practices for singing.

⁶¹ Scott McCoy, “The Choir Issue, Part One” *Journal of Singing* 67, no. 3 (January/February 2011), 297-301; Scott McCoy, “The Choir Issue, Part Two” *Journal of Singing* 68, no. 3 (January/February 2012), 287-89.

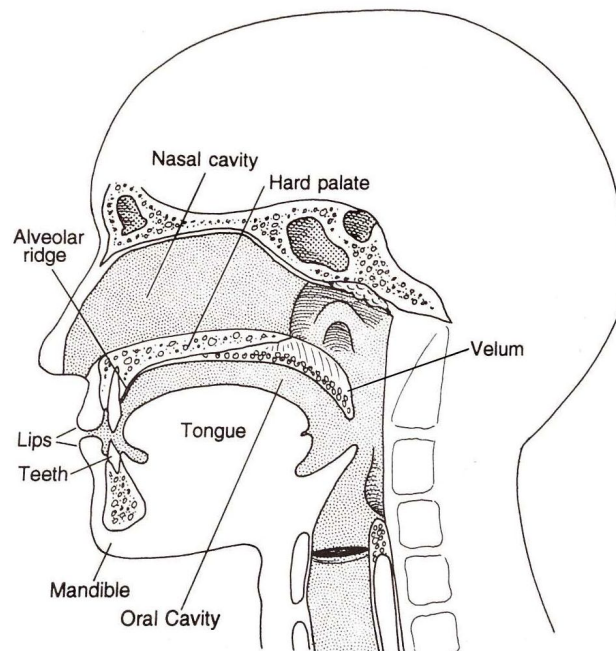
⁶² Sharon Hansen, Allen Henderson, Scott McCoy, Donald Simonson, and Brenda Smith, “Choral Directors Are from Mars and Voice Teachers Are from Venus: The Top Ten Complaints From Both Sides of the Aisle (or ‘The Farmer and the Cowman Should Be Friends’),” *The Choral Journal* 52, no. 9 (April 2012), 51-58; Sharon Hansen et al., “Choral Directors Are from Mars and Voice Teachers Are from Venus: ‘Sing from the Diaphragm’ and Other Vocal Mistructions, Part I,” *The Choral Journal* 54, no. 10 (May 2014), 47-53.

CHAPTER 3: THE ARTICULATORS

The **source-filter theory** of speech production states, “a voicing source is generated by the vocal folds and routed through the vocal tract where it is shaped into the sounds of speech.”¹ In singing, the larynx is the **source** and the articulatory system is the **filter**, shaping the vocal tract to govern its resonance characteristics. The following anatomical and physiological review of the articulatory system will give concentrated attention to the mobile articulators—the tongue, the jaw, the lips and the velum—because the study of singing involves strengthening one’s voluntary control over them. The immobile articulators—the alveolar ridge, the palate, and the teeth—are surfaces that provide points of articulation for consonants. Understanding their location is necessary to develop precise consonant articulation in singing (Figure 6). Further details about the immobile articulators will be discussed in Chapter 4.

¹ J. Anthony Seikel, Douglas W. King and David G. Drumright, *Anatomy and Physiology for Speech, Language and Hearing*, 3rd ed. (Clifton Park, NY: Thomson Delmar Learning, 2005), 264.

Figure 6. Overview of the mobile and immobile articulators.²



The Tongue

Among the articulators available for conscious manipulation, the tongue is undoubtedly the most important for singing. It is the most active. It is capable of the most rapid movement. Every action defines the shape of the vocal tract and thus the resonance characteristics of the sound. Every position assumed during phonation, including its resting state as found in /v/ and /m/, filters the laryngeal sound. Without phonation, it can act as a noise generator to produce unvoiced consonants such as /t, k, s/ and /ʃ/. "... Due to high innervation and to the complex arrangements of the muscle fibers making up the bulk of the tongue ... rapid and subtle sequences of movement are possible."³ Despite its

² J. Anthony Seikel, Douglas W. King, and David G. Drumright, *Anatomy and Physiology for Speech, Language, and Hearing*, 3rd ed. (Clifton Park, NY: Thomson Delmar Learning, 2005), 268.

³ Willard R. Zemlin, *Speech and Hearing Science: Anatomy and Physiology* (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1968), 277.

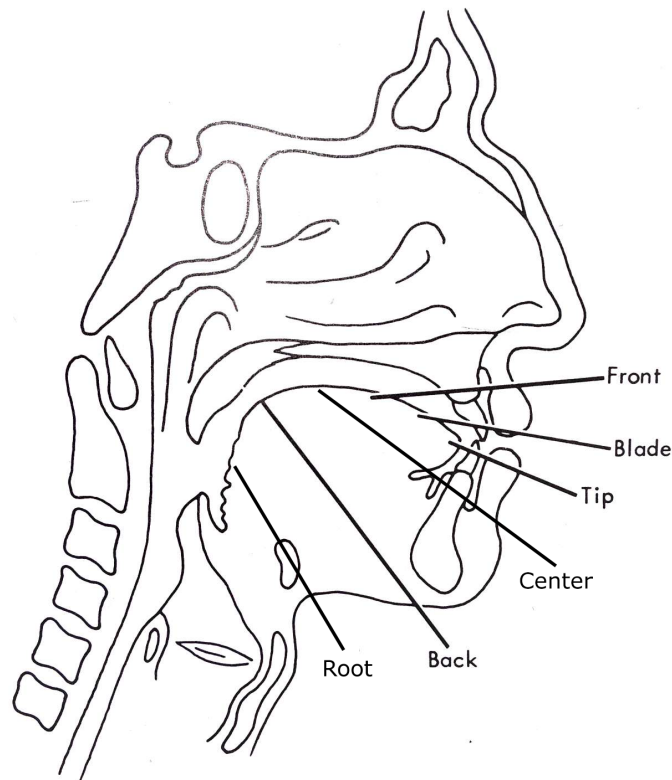
complexity, a basic understanding of its anatomy and functional capabilities are sufficient for singing teachers.

Phoneticians divide the tongue into six regions. Henning Reetz and Allard

Jongman's description of the regions are summarized below:

1. tip - frontmost part
2. blade - below the alveolar ridge when the tongue is in its neutral position
3. front of the tongue body - middle portion of the tongue; below the palate when tongue is at rest
4. center of the tongue body - beneath the palate and velum when tongue is at rest
5. back of tongue body - beneath the velum when tongue is at rest
6. tongue root - opposite the back wall of the pharynx⁴

Figure 7. The six regions of the tongue.⁵



⁴ Henning Reetz and Allard Jongman, *Phonetics: Transcription, Production, Acoustics, and Perception* (Chichester, U.K.: Blackwell, 2009), 12.

⁵ Zemlin, *Speech and Hearing Science*, 277. Figure 7 was modified by the author to include the root and the center.

Consonants are defined as obstructions of the vocal tract. Of the 21 consonants considered for this study, 17 of them are characterized by obstructions involving the tongue. Many consonants are produced when different regions of the tongue (see Figure 7) come into contact with points of articulation along the roof of the mouth. The tongue tip is the most frequently used, contacting the alveolar ridge to produce /t, d, n, l, s, z, r, ɹ, ɻ, ʃ, ʒ, tʃ/ and /dʒ/. It is held between the teeth to produce /ð/ and /θ/. The blade contacts the hard palate to produce /ɲ/. The back of the tongue body contacts the velum to produce /ŋ, g/ and /k/.

There are primarily eight muscles responsible for tongue movement. Four extrinsic muscles have their origins outside of the tongue, and four intrinsic muscles are contained within the tongue. “The muscles of the extrinsic group effect changes of position of the mass of the tongue plus changes of form, while the intrinsic muscles influence only the form of the body of the tongue.”⁶ The muscles and their functions are summarized in Table 3 and Table 4.

Table 3. Summary of the extrinsic muscles of the tongue.⁷

Muscle	Function
Extrinsic:	
Genioglossus	strongest and largest muscle of the tongue
posterior fibers	pulls root in anterior direction to aid protrusion of the apex
anterior fibers	retracts the tongue
Styloglossus	retracts the tongue; elevates lateral margins producing transverse concavity of dorsum; elevates root of tongue; antagonist of the genioglossus

⁶ Lyman Spicer V. Judson and Andrew Thomas Weaver, *Voice Science* (New York, NY: Appleton-Century-Crofts, 1965), 135.

⁷ Seikel, King, and Drumright, *Anatomy and Physiology*, 330-38; Judson and Weaver, *Voice Science*, 138; and Zemlin, *Speech and Hearing Science*, 278-82.

Muscle	Function
Hyoglossus	retracts and depresses the tongue; elevates hyoid
Palatoglossus	raises back of the tongue; lowers soft palate

Figure 8. Extrinsic muscles of the tongue, sagittal view.⁸

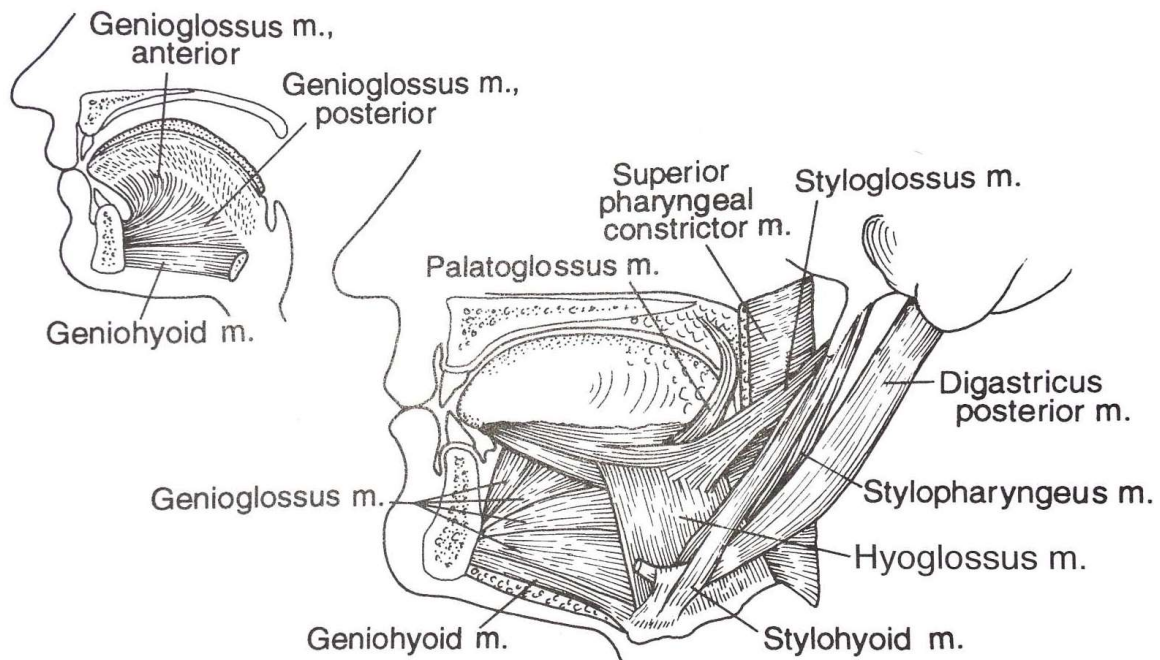


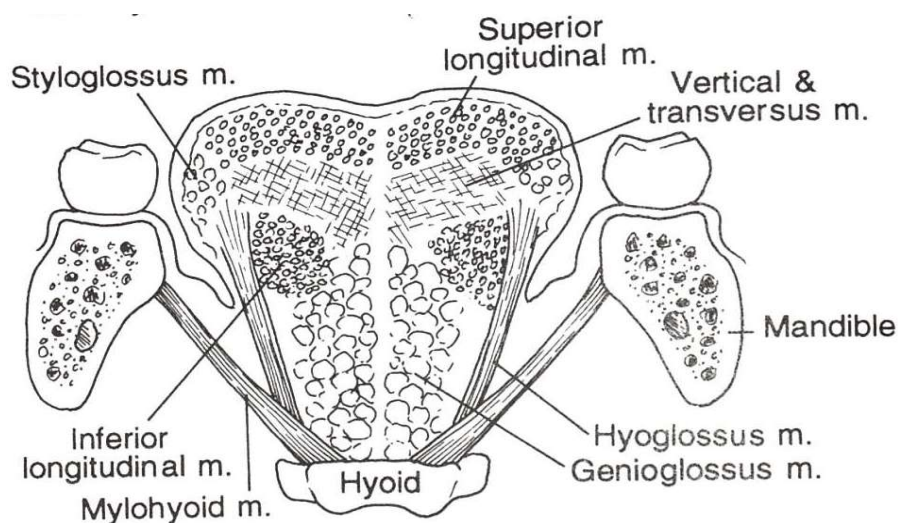
Table 4. Summary of the intrinsic muscles of the tongue.⁹

Muscle	Function
Intrinsic:	
Superior longitudinal	elevates tip; shortens tongue; pulls down front and side margins producing convexity of dorsum
Inferior longitudinal	pulls tip downward; assists retraction of tongue; pulls down front and side margins producing convexity of dorsum
Transversus linguae	elongates and narrows tongue
Verticalis linguae	broadens anterior half of tongue

⁸ Seikel, King, and Drumright, *Anatomy and Physiology*, 335.

⁹ Seikel, King, and Drumright, *Anatomy and Physiology*, 330-38; Judson and Weaver, *Voice Science*, 138; Zemlin, *Speech and Hearing Science*, 278-82.

Figure 9. Intrinsic muscles of the tongue, anterior view.¹⁰



It is difficult (and not entirely helpful to choral directors) to track the exact degrees of muscular contraction for a given articulation. Every articulation is a “complex pattern of finely graded changes in activity in which one or two of the muscles produce most of the movement, and others cooperate in movement, stabilize adjacent structures, or actively oppose the movement.”¹¹

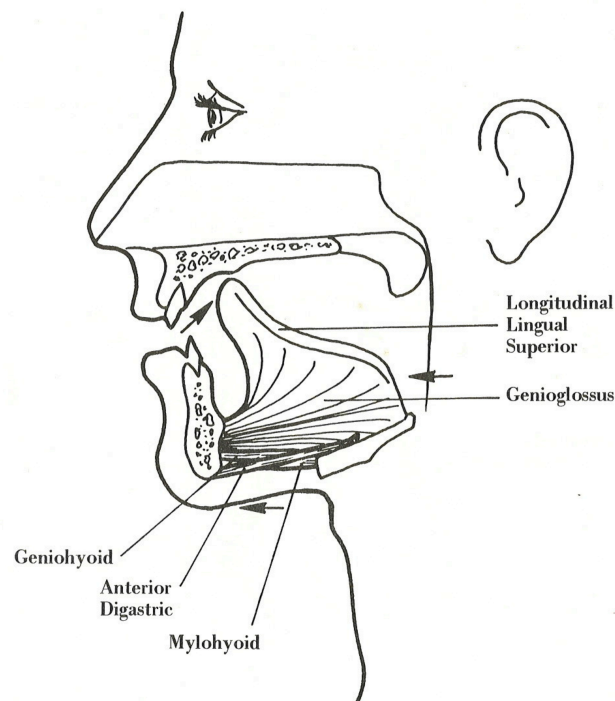
The tongue connects to the mandible, the hyoid bone, the epiglottis, and the soft palate. Because of this high activity and interconnectivity to other structures, it is often the source of vocal tension. It connects to the hyoid bone through extrinsic muscles—the hyoglossus, genioglossus, stylohyoid, digastricus, mylohyoid, geniohyoid, and thyropharyngeus muscles. The strap muscles are of special importance because they are involved in the act of swallowing. Their contraction elevates the hyoid, which elevates the larynx. An elevated larynx during singing shortens the vocal tract, often resulting in forced, strident tone and vocal fatigue.

¹⁰ Seikel, King, and Drumright, *Anatomy and Physiology*, 332.

¹¹ Zemlin, *Speech and Hearing Science*, 290.

Hyoid movement during spoken consonant articulation is principally in two directions: up-and-forward for the alveolar consonants (e.g. /t, d, n, l, s/), and up-and-backward for the velar consonants (e.g. /k, g, ŋ/).¹² The two types of articulation are illustrated in Figures 10 and 11.

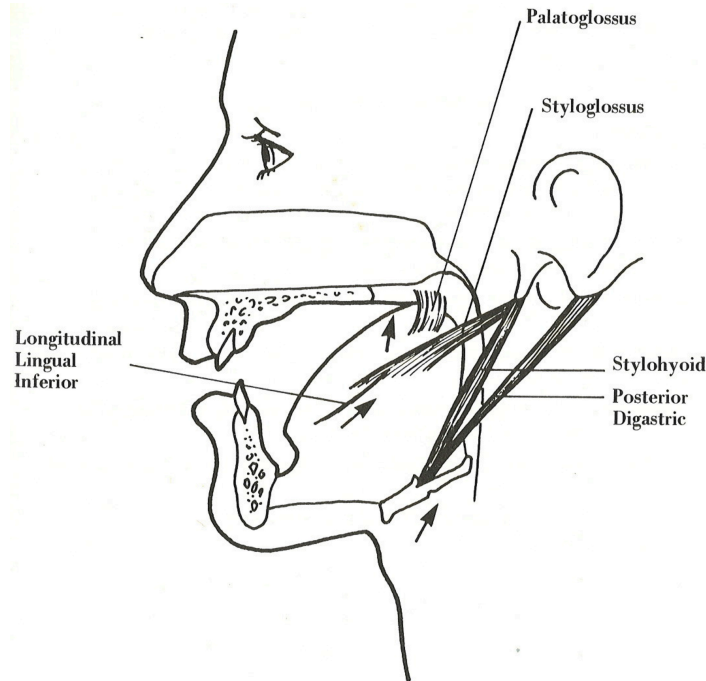
Figure 10. Muscular contractions for the articulation of alveolar consonants.¹³



¹² William M. Shearer, *Illustrated Speech Anatomy*, 3rd e. (Springfield, IL: Charles C. Thomas, 1979), 80.

¹³ *Ibid.*, 78.

Figure 11. Muscular contraction for the articulation of velar consonants.¹⁴



Great singing requires discipline of the tongue. For most, it “can be brought directly under the conscious control of the will, and can be strengthened and developed to [its] utmost.”¹⁵ However, Vennard warned:

“...some teachers argue that it does no good to speak of the ‘unruly member’, because if a pupil becomes self-conscious the law of reversed effort enters in, and the tongue becomes more unmanageable than ever. However, the teacher should know what he wants in this matter, and use his own discretion about how much he discusses it with the student.”¹⁶

To promote efficient tongue action, singing teachers must help their students locate and habituate the neutral place for the tongue. The tip should rest behind the lower teeth, and it should return to this neutral position after and in between articulatory gestures. Singers

¹⁴ Shearer, *Illustrated Speech Anatomy*, 79.

¹⁵ Eugene Feuchtinger, *The Voice: A Presentation of the Science and Art of Vocal Production and the Explanation of a Radical Discovery*, 9th ed. (Chicago, IL: Perfect Voice Institute, 1936), 66.

¹⁶ William Vennard, *Singing: The Mechanism and the Technic* (New York, NY: C. Fischer, 1967),

must develop this conditional response through training and practice. Vocalises based on vowels alone do not allow singers to master this technique. Vocalises that incorporate consonants provide the opportunity, but the principle must be part of the director's pedagogical thinking.

The Jaw

As the only movable bone in the face, the jaw's (or mandible's) role as an articulator for singing is significant because its movement changes the size of the oral cavity. Despite being the most massive articulator, it is one of the most rapid, second only to the tip of the tongue. With an approximate maximum rate of movement at 7.5 articulations per second (e.g. spoken repetitions of /pa pa pa/), it moves even faster than the back of the tongue, which can move at 7.1 articulations per second.¹⁷ The tip of the tongue can move up to approximately 8.2 times per second.

The principal function of the jaw is mastication, or the act of chewing. The jaw is equipped with some of the strongest muscles in the body. The muscles of mastication and their function are summarized in Table 5.

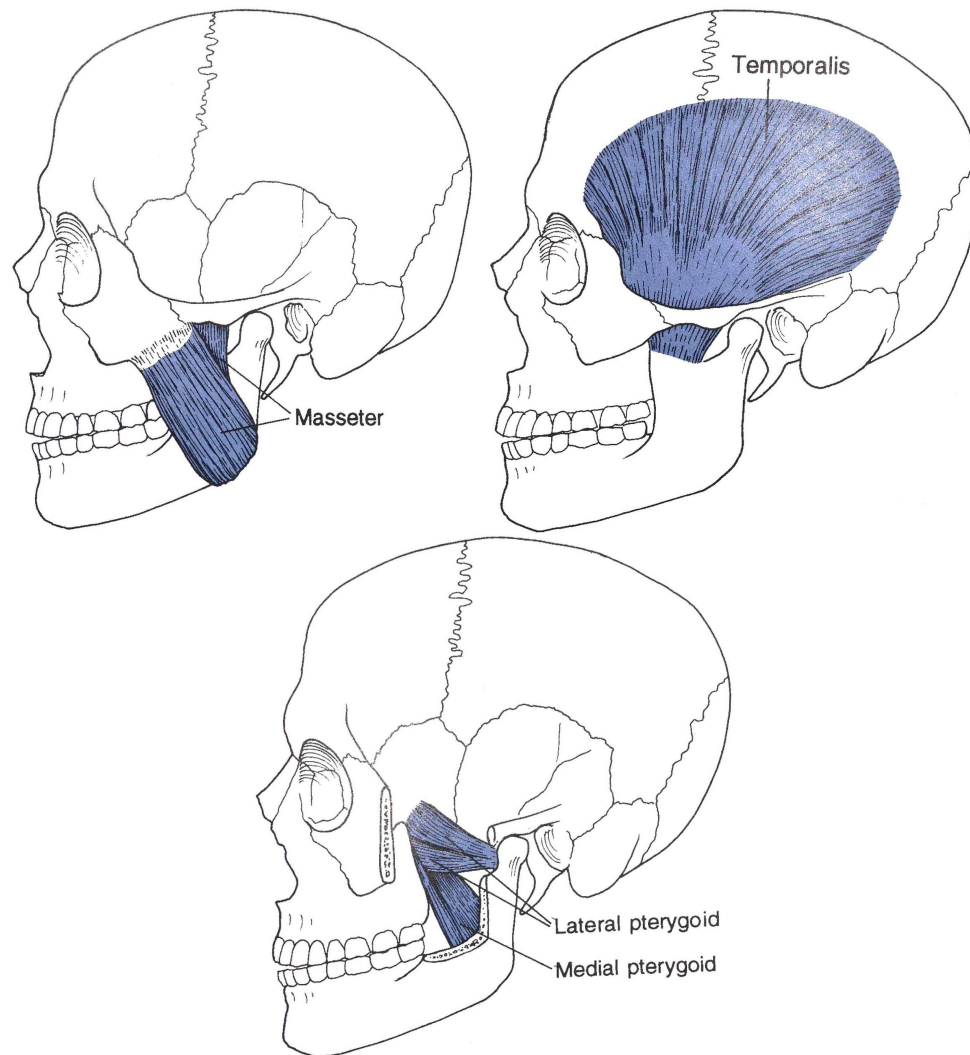
Table 5. Summary of the muscles of mastication.

Muscle	Function
Elevators:	
Masseter	elevates the mandible; most powerful
Temporalis	elevates and retracts the mandible; "a snapping muscle, built for speed"
Medial pterygoid muscle	elevates the mandible
Depressors:	
Digastricus	lowers the mandible; raises the hyoid and larynx

¹⁷ Zemlin, *Speech and Hearing Science*, 290.

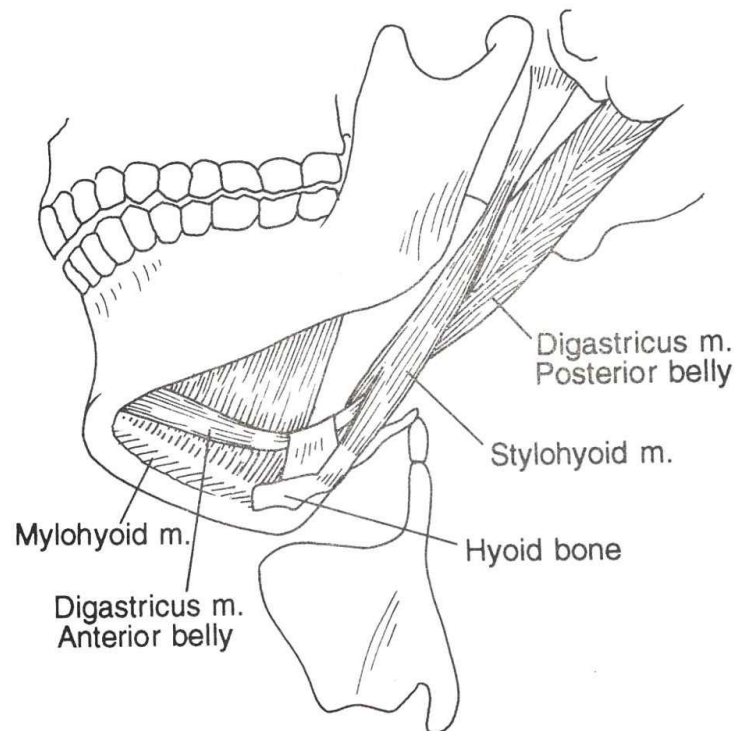
Muscle	Function
Mylohyoid	lowers the mandible; may also raise the hyoid, root of the tongue, and larynx
Geniohyoid	lowers the mandible; elevates the larynx
Lateral (or external) pterygoid	protrudes the mandible

Figure 12. Mandible elevators, sagittal view.¹⁸



¹⁸ Seikel, King, and Drumright, *Anatomy and Physiology*, 339-41.

Figure 13. Schematic of digastricus, mylohyoid, stylohyoid, and hyoid bone.¹⁹



The mandibular elevators raise the jaw and bring the molars into contact to grind food. They are much stronger than the mandibular depressors, the muscles involved in dropping the jaw to open the mouth (as in singing). The imbalance between the paired muscle groups means that muscular antagonism is discouraged in singing because the elevators easily overpower the depressors. Balance and flexibility are not accomplished through antagonism in the jaw. Hence, singing teachers typically promote a release of the jaw rather than a deliberate positioning of it.

“The mandible is an extremely important articulator in its supportive role of carrying the lips, tongue, and teeth to their targets ...”²⁰ According to Judson and Weaver, the converse is also true: “... in both speech and chewing movements the tongue makes many adjustments which directly aid the jaw movements and bring about

¹⁹ Seikel, King, and Drumright, *Anatomy and Physiology*, 198.

²⁰ *Ibid.*, 372.

refinements which would otherwise be impossible.”²¹ Movements of the jaw are often intentionally confined in singing technique to minimize usage, prevent fatigue, and relieve tension. For example, in speech the jaw will typically elevate to assist the tongue in the articulation of /n/; however, in singing the jaw might remain low to maintain openness and resonance in the oral cavity while the /n/ is articulated solely by the tongue.

The Lips

Many muscles of the face converge at the lips and exert force in different directions. “The direction of lip movement is the result of adding the directional forces of these muscles.”²² The muscles of the lips and the face are “so intrinsically related they exhibit functional unity.”²³ The most important muscle for consonant articulation is the **orbicularis oris**. It has been classified as both a single muscle encircling the mouth, and paired upper and lower muscles. Functional differentiation of the lips supports the designation of orbicularis oris superior for the upper lip, and orbicularis oris inferior for the bottom lip (Figure 14). The **buccinator muscles** are the principal muscles of the cheeks. They insert into the corners of the mouth. “Upon contraction the buccinator compresses the lips and cheeks against the teeth and draws the corners of the mouth laterally.”²⁴

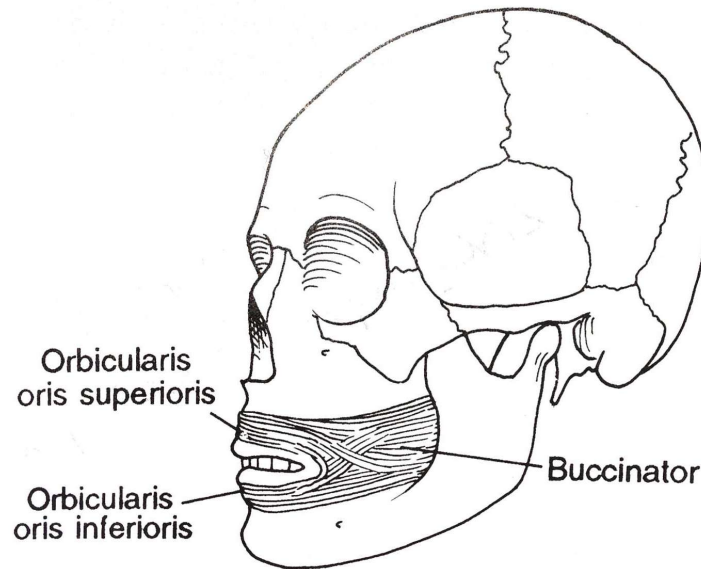
²¹ Judson and Weaver, *Voice Science*, 143.

²² Seikel, King, and Drumright, *Anatomy and Physiology*, 370.

²³ Zemlin, *Speech and Hearing Science*, 258.

²⁴ *Ibid.*, 261.

Figure 14. Muscles of the lips.²⁵



While the lips serve as a focal point for the facial muscles and interact with numerous muscles to produce a wide variety of facial gestures, they are regarded as “deceptively simple articulators.”²⁶ The orbicularis muscles are primarily responsible for the labial seal found in /p, b/ and /m/. Since the lower lip is attached to a movable articulator (the mandible), it is forced to adapt more quickly and more frequently than the upper lip. “The lower lip is capable of rapidly altering its rate of closure to accommodate a variety of jaw positions, unflinchingly.”²⁷ It also positions itself against the upper teeth to form the labio-dental consonants /f/ and /v/.

²⁵ Seikel, King, and Drumright, *Anatomy and Physiology*, 323.

²⁶ *Ibid.*, 370.

²⁷ *Ibid.*

The Velum

The velum, or the soft palate, is the “movable muscle mass separating the oral and nasal cavities.”²⁸ Its movements modify the resonant characteristics of the vocal tract, and the degree of coupling between the vocal tract and the nasal cavity.²⁹ Three types of muscles govern velum mobility: elevators, depressor relaxers, and elevator tensors. Their functions are summarized in Table 6.

Table 6. Summary of the muscles of the soft palate.³⁰

Muscle	Function
Elevators:	
Levator veli palatini	bulk of the soft palate; lifts the soft palate upward and backward, bringing it into contact with the posterior wall of the pharynx; separates the nasopharynx and oropharynx
Uvular muscle	shortens and lifts the soft palate; “seems to play no particular role in the English language”
Depressor relaxer:	
Glossopalatine (palatoglossus)	depresses soft palate; when soft palate is fixed, it may raise the sides and back of the tongue
Pharyngopalatine (palatopharyngeus)	depresses soft palate; extrinsic laryngeal elevator
Elevator tensor:	
Tensor palatine	Flattens, tenses, and slightly lowers the soft palate

In singing, the **levator veli palatini** is responsible for consistent elevation of the soft palate to create openness in the oral cavity. Most consonant articulation is produced with an elevated velum. High-pressure consonants such as fricatives and stops, e.g. /f, ʒ,

²⁸ Seikel, King, and Drumright, *Anatomy and Physiology*, 316.

²⁹ Zemlin, *Speech and Hearing Science*, 295.

³⁰ Zemlin, *Speech and Hearing Science*, 297-302; Judson and Weaver, *Voice Science*, 141-43; Seikel, King, and Drumright, *Anatomy and Physiology*, 344-48.

b, g/, require a complete seal of the **nasopharynx**. Depressor relaxer muscles are used to lower the velum for the English nasal continuants /m, n/ and /ŋ/. The nasal continuants are often used in vocalises to teach “bright” and “forward” resonance to young singers. Overuse of the nasal continuants may result in habitual depression of the soft palate, resulting in **hypernasal vowel production**—excessive nasal resonance due to an inadequately closed velopharyngeal port.

While velar elevation often correlates with good vowel and consonant production, conscious manipulation of the velum can be ineffective for beginning singers. The common instruction, “Keep the soft palate raised!” is not as useful as one might think. Most singers do not feel movements of the velum nor do they feel when it comes into contact with the pharyngeal wall. Deirdre Michael says the velum is capable of subtle manipulations but they are “more readily learned as a consequence of manipulating the aural feedback, rather than kinesthetic feedback.”³¹

³¹ Deirdre Michael, “Dispelling Vocal Myths: Part V ‘Sniff to Raise the Palate!’” *Journal of Singing* 71, no. 3 (January/February 2015), 320.

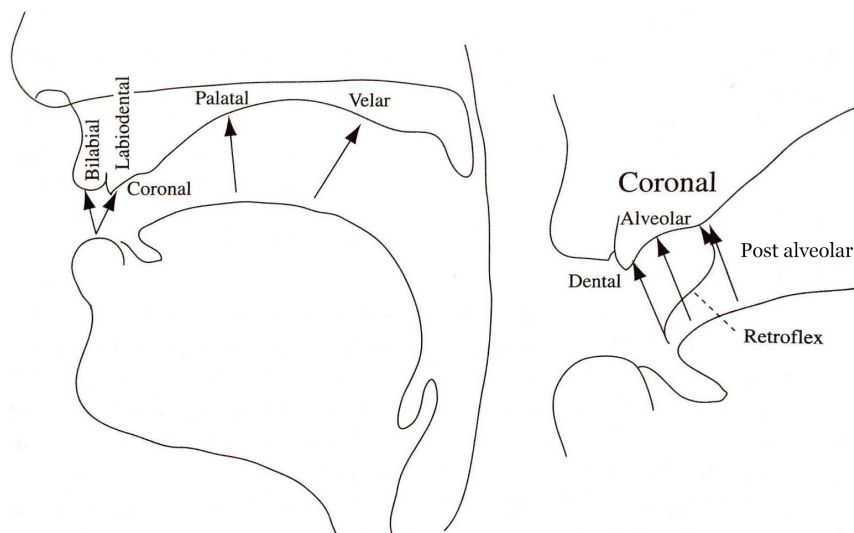
CHAPTER 4: PEDAGOGICAL ANALYSIS OF CONSONANTS

This chapter identifies pedagogical uses of particular consonants as well as consonant-related vocal faults that typically occur in collegiate choral settings. The consonants included in this study are limited to those found in lyric diction for English and Roman Latin.

According to traditional phonetic analysis, consonants are identified by (1) phonation, (2) the place of articulation, and (3) the manner of articulation.¹ Phonation refers to whether the consonant is voiced or unvoiced (e.g. /z/ versus /s/). The **place of articulation** is the location in the vocal tract where the airstream is obstructed. Places of articulation are shown in Figure 15:

¹ Leslie De'Ath, "Phonetic Transcription—What It Doesn't Tell Us," *Journal of Singing* 70, no. 1 (September/October 2013), 59-74. Leslie De'Ath suggests *generative phonology* as a possible alternative to this method of classification. "The generative approach was formulated—now more than fifty years ago—as a tool, more precise than earlier phonemic approaches, to enable a comprehensive exegesis of all aspects of the phonological behavior of a particular language." The system provides a more complete phonetic representation of sound compared to IPA, but the amount of technical knowledge required for comprehension remains impractical for applied musicians.

Figure 15. Places of articulation in the vocal tract, midsagittal view. The coronal region is shown in more detail on the right.²



The different manners of articulation are:

1. Plosive or stop – A complete obstruction in the mouth stops the oral flow of air. The velum is elevated to block the nasopharyngeal port. Air cannot escape through the mouth or nose. Air pressure builds and when the obstruction is released, there is a small explosion of sound. Ex: /p/ and /b/.
2. Nasal – A complete obstruction in the mouth stops the oral flow of air. The velum is lowered to allow air to escape through the nose. Ex: /m/ and /n/.
3. Fricative – A partial obstruction generates turbulent noise. Air continues to flow through the narrow constriction, producing a hissing quality. Ex: /s/ and /z/.
4. Affricate – A combination of stop and fricative, occurring in that order, but perceived as a single unit. Ex: /tʃ/ and /dʒ/.
5. Approximant – A partial obstruction created when one articulator approaches another, but not close enough to create friction. The constriction between articulators is greater than for a vowel, but smaller than for a fricative. They are sometimes referred to as semi-vowels. Ex: /l/, w, ɹ/³

² Peter Ladefoged and Keith Johnson, *A Course in Phonetics*, 6th ed. (Boston, MA: Wadsworth, 2011), 11.

³ Henning Reetz and Allard Jongman, *Phonetics: Transcription, Production, Acoustics, and Perception* (Chichester, UK: Wiley-Blackwell, 2009), 14-16; Peter Ladefoged and Keith Johnson, *A Course in Phonetics*, 6th ed. (Boston, MA: Wadsworth, 2011), 14-17.

Consonants are traditionally described according to these three characteristics (phonation, place of articulation, and manner of articulation). For example, /ʃ/ is an *unvoiced post-alveolar fricative* and /ʒ/ is a *voiced post-alveolar fricative*. In most cases, the place of articulation refers to the immobile articulator and the mobile articulator is assumed to be the tongue (thus, *voiced post-alveolar fricative* rather than *voiced lingua-post-alveolar fricative*). When the tongue is not one of the articulators, the mobile articulator is named (e.g. the lips in labials or the lips and teeth in labiodentals).

Plosives

The three phases of plosives are: (1) the implosion, (2) the closure interval, and (3) the release.⁴ The **implosion** occurs when the articulators move toward one another to obstruct the vocal tract, such as when the lips come together for /p/. The **closure interval** is the time that passes as the obstruction is held. Italian double consonants such as the /k: k/ in “ecco” have long closure intervals because the duration of the stop is held. The **release** refers to the articulators’ release of the obstruction, such as when the lips part after the “p” in /pa/.

Plosive consonants significantly impact airflow and phonation. Speech scientists found that the acoustic and physiological effects of plosives impact the pitch of a subsequent vowel. During the closure interval of a *voiced plosive*, vocal fold stiffness decreases. “This vocal fold slackening carries over into the following vowel, causing a decreased fundamental frequency of vocal fold vibration ... this lowering of the fundamental frequency would be observed in a vowel immediately following a voiced

⁴ Kenneth Stevens, *Acoustic Phonetics* (Cambridge, MA: The MIT Press, 1998), 323-24.

unaspirated stop consonant.”⁵ During the closure interval of an *unvoiced plosive*, an increase in vocal fold stiffness results in an “increased fundamental frequency observed at the beginning of the following vowel.”⁶ In normal speech, the frequency change is expected to be around 7 Hz for male voices and 14 Hz for a female voices (about one semitone in the lower range of each gender).⁷

Aspirated consonants are most common in English and German compared to the other primary singing languages. An aspiration occurs when the vocal folds remain abducted after the consonantal constriction is released resulting in audible airflow.⁸ For example, the *p* in “pie” (/paɪ/) is aspirated because there is a slight /h/ in between the /p/ and the /a/. A **narrow transcription** (or **phonetic transcription**) would indicate the aspiration with the diacritic *h*, as in [p^haɪ]. Similarly, the aspirated *t* in “top” results in the phonetic transcription: [t^hɒp]. An *s* eliminates the aspiration of any consonant that follows it if both are followed by a vowel. For example, adding *s*’s to the preceding examples changes [p^haɪ] to [spaɪ], and [t^hɒp] to [stɒp].

Aspiration appears to be a fundamental issue in the vowel versus consonant paradox. Voicelessness of aspiration infects the stream of phonation—the essence of what many voice teachers aim to develop. Vowels that follow aspirated consonants are prone to inherit breathiness. “Breathiness is an inefficient form of phonation and usually results in a very limited intensity range.”⁹ A research team led by Maria McDonnell found that “high-frequency partials appeared earlier after unaspirated than after aspirated

⁵ Stevens, *Acoustic Phonetics*, 470.

⁶ Ibid., 471.

⁷ Ibid., 470.

⁸ Reetz and Jongman, *Phonetics*, 37.

⁹ Zemlin, *Speech and Hearing Science*, 207.

versions of the consonant /p/. Early arrival of high-frequency components seems to be typical of classical western singing.”¹⁰ In addition to its impact on subsequent vowels, aspiration may also affect the preceding vowel. Just prior to the implosion of an aspirated consonant, “the glottis begins to spread in preparation for the generation of aspiration noise ...”¹¹

In many choral situations, singers are asked to exaggerate consonants and the result becomes highly aspirated consonants. For example, “confutatis maledictis” from the popular *Dies Irae* text enunciated with Roman Latin may be narrowly transcribed as: [kʰɔnfuˈt̪at̪is malɛˈd̪ikt̪is]. With the style of exaggerated diction often employed by American choirs, the enunciation becomes: [kʰɔnfʰuˈt̪at̪is malɛˈd̪ikʰt̪is]. The high recurrence of aspirated consonants in exaggerated diction (increased sevenfold) expels more air, causes vocal fold abduction, and diminishes the singer’s formant.

A **formant** is a resonance of the vocal tract.¹² They are numbered and named first formant (F₁), second formant (F₂), third formant (F₃), etc. The locations of the formants depend on the position of the articulators and the shape of the vocal tract. “The primary acoustic characteristic of vowels is the location of the formant frequencies, specifically, the first three formants (F₁-F₃).”¹³ Trained singers have learned to manipulate these formants through vowel modification. The **singer’s formant (F_S)** is a “cluster of powerful formants around 3 kHz that singer’s training aims to develop, and which aids

¹⁰ Maria McDonnell, Johan Sundberg, Joakim Westerlund, Per-Ake Lindestad, and Hans Larsson, “Vocal Fold Vibration and Phonation Start in Aspirated, Unaspirated, and Staccato Onset,” *Journal of Voice* 25, no. 5 (September 2011), 531.

¹¹ Stevens, *Acoustic Phonetics*, 454.

¹² Reetz and Jongman, *Phonetics*, 174.

¹³ *Ibid.*, 183.

vocal projection.”¹⁴ Its presence also helps to improve intelligibility because the ear has particular sensitivity in the region of F_s.¹⁵

Bilabial Plosives

Figure 15. Midsagittal view of articulation during /p, b/.¹⁶



/p/ unvoiced bilabial plosive

/b/ voiced bilabial plosive

Tongue	neutral
Lips	occlusion then release
Jaw	slight elevation then depression
Velum	elevated

¹⁴ Philip A. Fine and Jane Ginsborg, “Making Myself Understood: Perceived Factors Affecting the Intelligibility of Sung Text,” *Frontiers in Psychology* 5, no. 809 (September 2014), 2; Jack Morris and Rudolf Weiss, “The Singer’s Formant Revisited: Pedagogical Implications Based on a New Study,” *Journal of Singing* 53, no. 3 (January/February 1997), 21-25. The frequency range varies between 2600-4000 Hz depending on the author. Miller claimed it was from 2500-3300 Hz. Coffin designated values according to voice type: 2200 Hz for basses, 2700 Hz for baritones, 2800 Hz for tenors, and 3200 Hz for altos.

¹⁵ Eric J. Hunter and Ingo R. Titze, “Overlap of Hearing and Voicing Ranges in Singing,” *Journal of Singing* 61, no. 4 (March/April 2005), 387-392.

¹⁶ Kathryn LaBouff, *Singing and Communicating in English: A Singer’s Guide to English Diction* (New York, NY: Oxford University Press, 2008), 120.

The bilabial plosives are articulated with a complete occlusion at the lips that momentarily stops airflow through the mouth. Joan Wall described the lip closure as “firm” but with “no excessive tension at the cheeks, lips, or the throat.”¹⁷ The tongue does not participate in the obstruction, therefore, these consonants may be used to practice the neutral tongue position. The velum elevates to stop airflow to the nose. Without this closure (that must occur simultaneously with the lip closure), the plosive quality is nearly impossible. Since velar elevation almost always occurs without conscious manipulation in the production of /p/ and /b/, these consonants may be used to strengthen the velar elevator muscles (**levator veli palatini**). This helps singers who suffer from **hypernasality**, or excessive resonance in the nasal cavity due to a lowered velum during vowel production.

The phonemes /p/ and /b/ may be used as initial consonants in exercises to encourage forward resonance. Richard Miller wrote: “The sudden release of the lips often brings the perception that ‘tone’ has been directly produced at the lips, and this has psychological (as well as physiological) implications for persons whose attention has been excessively directed toward the pharyngeal or laryngeal areas.”¹⁸

When the lips do not reach complete closure, the consonant loses distinctness and intelligibility. Wall and Caldwell said this typically occurs when /p/ and /b/ are in medial or final positions such as in “happy” and “robe.”¹⁹ On the other hand, if the lips are

¹⁷ Joan Wall and Robert Caldwell, *Diction for Singers: A Concise Reference for English, Italian, Latin, German, French, and Spanish Pronunciation*, 2nd ed. (Redmond, WA: Robert Caldwell, 2009), 24.

¹⁸ Miller, *Structure of Singing*, 97.

¹⁹ Wall, *Diction for Singers*, 24.

overly constricted, tension may transfer to other muscle groups (facial muscles, strap muscles, jaw muscles, etc.) and the tongue can be pulled out of its neutral position.

Kathryn LaBouff said there should be “no air compression behind the lips.”²⁰ This is an overstatement because some amount of air compression is necessary to produce the burst of air characteristic of plosives, but the instruction may help singers to develop more sensitive breath coordination. During the closure interval, the buildup of air should remain at a manageable level otherwise the lips will compensate with heightened tension in attempt to preserve complete closure.

Reetz and Jongman summarized the influence of bilabial plosives on formant frequencies. They reported that lip constriction typically lowers the formant frequencies of both vowels and consonants.²¹ During the release of a bilabial plosive, frequency energy is concentrated in the 500-1,500 Hz range. (Velar plosives typically produce energy between 1,500 and 2,500 Hz, and alveolar plosives between 2,500 and 4,000 Hz.²²) This spectrum of frequencies is known as the “burst frequency.”²³ Bilabial plosives have the lowest burst frequency range compared to the other types of plosives. These measurements were calculated for speech production, not singing production; however, since speech habits tend to influence singing—especially in the consonant articulation of young singers—it is likely that the low burst frequencies of /p/ and /b/ weaken F_S more than the other plosives. It may be necessary to drill the bilabial plosives more frequently so that singers learn to recover from the affects of low burst frequencies.

²⁰ LaBouff, *Singing and Communicating in English*, 120.

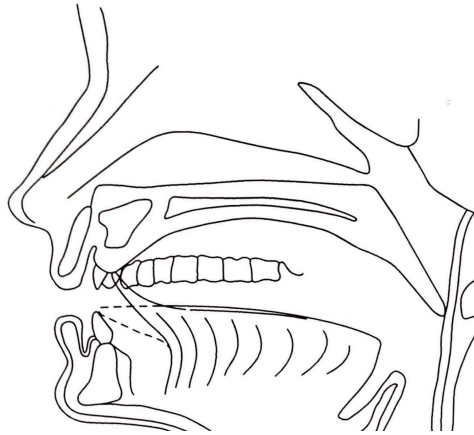
²¹ See the discussion of the resonating frequencies of cylindrical tubes in Reetz and Jongman, *Phonetics*, 163-169.

²² Reetz and Jongman, *Phonetics*, 193.

²³ *Ibid.*, 193.

Alveolar Plosives

Figure 16. Midsagittal view of articulation during /t, d/.²⁴



/t/ unvoiced alveolar plosive

/d/ voiced alveolar plosive

Tongue	tip contacts the alveolar ridge and sometimes the upper teeth
Lips	neutral
Jaw	neutral
Velum	elevated

The alveolar plosives are articulated with the tip of the tongue at the alveolar ridge. They may be dentalized ([t̪] and [d̪]), but this is usually reserved for foreign languages (Italian, Spanish, and French) because it produces a distinctive European sound. English /t/ and /d/ are typically more percussive and aspirate ([t^h] and [d^h]). The lips are not involved in the articulation of /t, d/ but they may be rounded or pursed in anticipation of an impending vowel. For example, the lips are inactive during the /t/ of /ti/ (“tea”), but may be rounded during the /t/ of /tu/ (“two”). This is an example of **anticipatory coarticulation.**²⁵

²⁴ LaBouff, *Singing and Communicating in English*, 123.

²⁵ Reetz and Jongman, *Phonetics*, 39.

Alveolar plosives produce the highest “burst frequencies”—the spectrum of frequencies found at the release of a plosive consonant.²⁶ With a burst frequency range between 2,500-4,000 Hz, alveolar plosives reinforce frequencies in the singer’s formant. The phonemes /t/ and /d/ may be used in accordance with vowels in vocalises to support the development of consistent resonance.

Inexperienced singers have a tendency to articulate /t/ and /d/ toward the back of the alveolar ridge, approaching the post-alveolar surface used for /ʃ/ and /ʒ/. This action narrows the shape of the tongue, which has a tendency to weaken resonance, and the jaw becomes more active as an assisting articulator. Most pedagogues agree that placement should occur toward the front of the alveolar ridge for efficient production. Doing so creates more resonating space behind the constriction, flattens the shape of the tongue, and it is less demanding on jaw movement.

Velar Plosives

Figure 17. Midsagittal view of articulation during /k, g/.²⁷



²⁶ Reetz and Jongman, *Phonetics*, 193.

²⁷ LaBouff, *Singing and Communicating in English*, 127.

/k/ unvoiced velar plosive

/g/ voiced velar plosive

Tongue	center/back of tongue body contacts the velum and/or the back of the hard palate
Lips	neutral
Jaw	neutral
Velum	elevated

The place of articulation for the velar plosives depends on coarticulation for the subsequent vowel. When followed by a front vowel such as in the word “keep” (/kip/), the articulation is more anterior with the center of the tongue body contacting the back of the hard palate.²⁸ When followed by a back vowel such as in the word “gone” (/ɡɒn/), the back of the tongue body contacts the velum. Variation between the places of articulation are not as important as the position of the tip of the tongue, which should rest behind the lower teeth. If the tip retracts from this position, extraneous movement is introduced to the consonant which often leads to tongue tension or is a result of preexistent tongue tension.

Velar plosives can be articulated without assistance from the jaw, unlike the alveolar and bilabial plosives. /k and /g/ are useful for vocalises with open vowels such as /a/ and /ɔ/ because the jaw can retain a lowered position for both consonant and vowel (e.g. /ka ka ka/).

Miller suggested using /k/ and /g/ to increase awareness of openness in the back of the mouth. Articulation for the velar plosives creates a complete occlusion in the back of the mouth (and even more posterior when followed by a back vowel, as discussed above). When the occlusion is released, the air “explodes directly into the buccal cavity, producing a condition of openness in the channel between the oropharynx and the oral

²⁸ Stevens, *Acoustic Phonetics*, 374-75.

cavity. The sensation from that event is very distinct and extremely useful. When a singer habitually suffers from a lowered velar posture, with resultant nasality and thinness of quality, the use of /g/ can prove to be a valuable antidote.”²⁹

Without proper training, the velar plosives have the potential to induce guttural and throaty singing.³⁰ As the place of articulation moves posteriorly from the front of the mouth (e.g. bilabial) to the back of the mouth (velar), the length between the glottis and the constriction shortens. The short surface area behind velar constriction creates a short tube whose intraoral pressure rises more rapidly than that of a long tube. The pressure creates an outward force on the pharyngeal walls and the surfaces of the glottis. Thus, velar plosives require more careful breath coordination compared to other consonants.

Fricatives

Fricatives are produced with a narrow constriction (semi-occlusion) that impedes but does not completely stop the flow of air. Acoustically, they are characterized according to four attributes: (1) “spectral properties of the friction noise,” (2) “amplitude of the noise,” (3) “duration of the noise,” (4) and “spectral properties of the transition into and out of the surrounding vowels.”³¹ Spectral properties of the friction noise are determined by the place of articulation. They are the primary aural cues that distinguish /f/ from /θ/, /θ/ from /s/, /s/ from /ʃ/, etc. Alveolar and post-alveolar fricatives (e.g. /s, z, ʃ/ and /ʒ/) produce “clear, distinct spectral shapes” because the manner in which the airstream hits the teeth creates an intense, high-frequency noise.³² Conversely, the

²⁹ Miller, *Structure of Singing*, 103.

³⁰ LaBouff, *Singing and Communicating in English*, 127-28.

³¹ Reetz and Jongman, *Phonetics*, 189.

³² *Ibid.*, 191.

labiodental and dental fricatives produce a “relatively flat spectrum.”³³ Also, the amplitude of the friction noise for /s, z, ʃ, ʒ/ is substantially greater than for /f, v, θ, ð/.³⁴

The unvoiced fricatives have long been employed as devices for teaching breath management such as in the hissing exercises found in Ehmann, Haasemann, and Jordan (see pg. 31). The voiced fricatives have become increasingly popular for vocal exercise due to recent scientific evidence supporting the use of semi-occluded vocal tract exercises. John Nix and C. Blake Simpson have examined the affects of singing on sustained voiced fricatives, nasal continuants, and vocalizing through straws. The following physiological and acoustical benefits were identified:

1. A high ratio of vocal output to vocal fold vibration amplitude ... these postures tend to encourage what is known as a high maximum flow declination rate, which is to say the vocal folds cut off the air flow very quickly each vibration cycle. It is this rapid shutting off of the flow that excites higher frequencies. Moreover, these postures achieve this rapid shutting off of the flow with relatively low vocal fold vibration amplitude. The result is more bang (acoustic output) for fewer bucks (low effort and reduced risk of tissue damage).
2. Some semi-occluded postures may encourage a narrowing of the epilaryngeal outlet, which may aid the production of the singer’s formant cluster and may aid in matching the glottal impedance with the input impedance of the vocal tract.
3. Improved breath management. A vocalist can engage greater thoracic and abdominal “support” without using a pressed phonation.
4. Lowered phonation threshold pressure. The positive pressures above the glottis lower the pressure needed to initiate and sustain phonation.
5. “Head voice” sensation is encouraged. This may be the most immediately tangible aspect of these postures in the voice training studio. This is due not only to the sympathetic vibration of the orofacial tissues and sinuses of the face and skull, but also to a coupling of the vibration of the upper surface of the vocal folds with acoustic pressures above the glottis.
6. A higher ratio of thyroarytenoid muscle activation to cricothyroid muscle activation during and after use of the semi-occluded postures. This is

³³ Reetz and Jongman, *Phonetics*, 191.

³⁴ *Ibid.*, 192.

similar to that which has been found when contrasting “covered” singing with “open” singing.³⁵

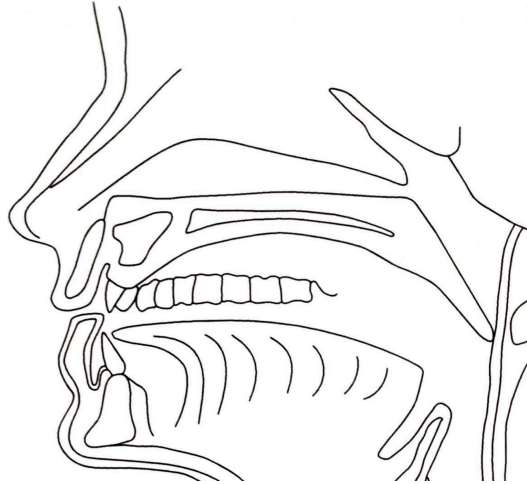
More recently, Ingo R. Titze identified an aerodynamic benefit of semi-occlusion. He observed that during vowel production there is greater pressure beneath the vocal folds compared to the pressure above them. A semi-occlusion in the vocal tract creates a steady back pressure that “may help to balance an always strong pressure below the vocal folds in a way that the vocal fold surfaces can be maintained more parallel.”³⁶ This type of vibration is the most stable, which is why semiocclusion exercises and voiced fricatives are frequently used to develop ease in phonation, resonance, balanced vocal fold adduction, and registration.

³⁵ John Nix and C. Blake Simpson, “Semi-Occluded Vocal Tract Postures and Their Application in the Singing Voice Studio,” *Journal of Singing* 64, no. 3 (January/February 2008), 339-40.

³⁶ Ingo R. Titze, “One More Small Step in Solving the Mystery of the Benefits of Semioccluded Vocal Tract Exercises,” *Journal of Singing* 69, no. 3 (January/February 2013), 305-06.

Labiodental Fricatives

Figure 18. Midsagittal view of articulation during /f, v/.³⁷



/f/ unvoiced labiodental fricative

/v/ voiced labiodental fricative

Tongue	neutral
Lips	lower lip contacts the upper incisors
Jaw	elevated
Velum	elevated

The bottom lip is held against the upper incisors during the production of labiodental fricatives. The jaw elevates and may retract slightly to assist the posturing of the bottom lip. Velum elevation is not required to produce an intelligible /v/ or /f/, but complete closure of the nasopharyngeal port increases air velocity through the oral constriction which increases turbulent noise.³⁸ The tongue is neutral as an articulator for the consonant, but it often coarticulates one of the surrounding vowels. Because articulator movement is minimal for the production of labiodental fricatives, /v/ and /f/

³⁷ LaBouff, *Singing and Communicating in English*, 143.

³⁸ Stevens, *Acoustic Phonetics*, 387-88.

recall the “central phonetic position” which singers may associate with “pleasure and repose.”³⁹ They may be used to relieve tension in the jaw, tongue, and facial muscles.

“The physical location of /v/ encourages sensations in the *masque* area of the face.”⁴⁰ It may be used before a vowel to initiate resonance at the front of the mouth. The /v/ (as well as the other voiced fricatives) may be sustained to stabilize vocal fold adduction before releasing into the vowel. This technique can be used to guide register transitions because, as one of the postures of semioclusion, /v/ helps to balance the push and pull of the intrinsic muscles of the larynx (thyroarytenoids and cricothyroids).⁴¹

Articulation for labiodentals requires enough jaw elevation to allow contact between the lower lip and upper teeth. Teachers should be aware of surrounding vowels that require jaw lowering, such as open vowels (/a, ɑ, ɒ, ɔ/) or vowels in high tessitura that require modification, because closure for /f/ and /v/ will require significant jaw movement. The jaw is flexible and quick enough to execute such tasks without tension, but for some singers, it will necessitate training and attention.

The spectral properties of labiodental fricatives make them difficult to project, especially in comparison to vowels and high frequency consonants such as /s, ʃ, t, k/. Voiced /v/ is similar to its unvoiced counterpart /f/, but it contains “additional low-frequency energy corresponding to vocal fold vibration and slightly less intensity in the higher frequencies because part of the energy of the airstream serves to make the vocal folds vibrate.”⁴² As a result, /v/ can be difficult to hear. Singers may be tempted to apply excessive pressure in attempt to generate more noise. Their efforts must not result in

³⁹ Miller, *Structure of Singing*, 96.

⁴⁰ Ibid., 96.

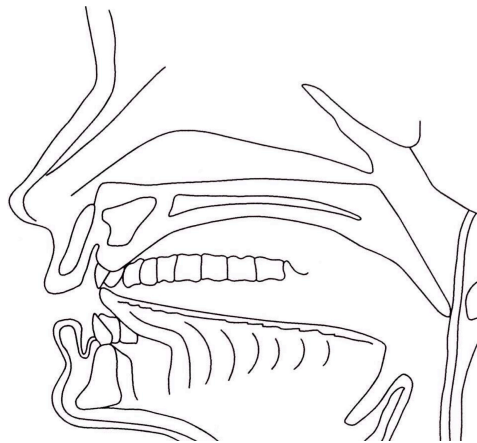
⁴¹ Nix and Simpson, “Semi-Occluded Vocal Tract Postures,” 340.

⁴² Reetz and Jongman, *Phonetics*, 192.

clenching of the jaw, tension at the root of the tongue, biting of the lower lip, or constrictions in the facial muscles that insert into the lips.

Dental (or Inter-Dental) Fricatives

Figure 19. Midsagittal view of articulation during /θ, ð/.⁴³



/θ/ unvoiced dental fricative

/ð/ voiced dental fricative

Tongue	tip contacts the upper and lower incisors
Lips	neutral
Jaw	raised to a half-closed position
Velum	elevated

During the articulation of dental fricatives, the jaw is partially elevated to bring the upper and lower incisors into close proximity. “The tip of the tongue is in light contact with the upper incisors and slightly protruded so that the inferior surface rests upon the lower teeth.”⁴⁴ The blade and body of the tongue should be flattened; narrowing of the tongue is unnecessary and will likely produce stiffness in subsequent vowels. Like

⁴³ LaBouff, *Singing and Communicating in English*, 157.

⁴⁴ Appelman, *The Science of Vocal Pedagogy*, 382.

the labiodental fricatives, complete velar elevation and nasopharyngeal blockage is not essential for /θ, ð/ but it helps to increase turbulent noise at the teeth.

The forward fixation of the tongue in articulation for /θ/ and /ð/ helps singers who suffer from “throaty” or “froggy” tone due to habitual tongue retraction. Many teachers vocalize their students on sustained /ð/ to help them relieve tongue tension. While that initial consonantal posture is useful in isolation, the tongue is forced to retract when a dental fricative is followed by a vowel. Teachers and students should be aware of this transition because singers with tongue tension are likely to over-retract the tongue. The tip of the tongue must be trained to move quickly and accurately from its position between the teeth to its resting place behind the lower teeth.

In addition to the aforementioned benefits related to semioccluded postures—balanced intraoral pressures, optimal vocal fold vibration, regulated breath stream, coordination between thyroarytenoids and cricothyroids, etc.—the voiced dental fricative /ð/ creates strong “buzzy” sensations in the upper jaw and masque areas.⁴⁵ This is a result of air and energy being directed toward the upper teeth and alveolar ridge by the tip of the tongue. When sustained /ð/ is used in various areas of a singer’s range, the singer experiences valuable feedback regarding vibratory sensations and breath intensity. “Through exercises involving this consonant, the singer becomes aware of the desirable balances among buccal, nasal, and pharyngeal resonators.”⁴⁶

⁴⁵ Miller, *Structure of Singing*, 99.

⁴⁶ Ibid.

Figure 20. Midsagittal view of articulation during /s, z/.⁴⁷



/s/ unvoiced alveolar fricative

/z/ voiced alveolar fricative

Tongue	sides press against the upper back teeth, grooved dorsum directs air toward tip, blade in near-contact with the alveolar ridge
Lips	neutral
Jaw	raised to a half-closed position
Velum	elevated

Although the alveolar fricatives share their place of articulation with consonants such as /t, d/ and /n/, the shape of the tongue is distinct and cannot be fully captured by a midsagittal view of the mouth. The sides of the tongue press against the upper back teeth to prevent lateral escaping of air. The grooved dorsum directs the airstream toward the tip of the tongue, and the blade comes into near contact with the alveolar ridge. If the tip of the tongue were to contact the alveolar ridge, a complete seal would form as in the articulation of /t/ and /d/. In producing /ts/ or /dz/, the only movement between consonants is the release of the tip of the tongue from against the alveolar ridge.

⁴⁷ LaBouff, *Singing and Communicating in English*, 147.

The slight parting of the lips and loosely positioned jaw (as long as the incisors are not pressed together in exaggeration) recall the “central phonetic position” advocated by Miller. He claimed the minor adjustments required by alveolar fricatives “illustrate the possibility of minimal technical entanglement in singing.”⁴⁸ However, repeated alveolar fricatives on open vowels (e.g. /za za za/) can be demanding on the jaw muscles, so singers should be reminded to maintain flexibility and looseness.

Misarticulations of /s, z/ are often due to lisps, but in most choral situations corrective training is unnecessary.⁴⁹ Several lisps will not disrupt a majority of correctly enunciated s’s. The turbulent noise produced by /s/ and /z/ have the highest, most intense frequencies, and it is the most audible of all consonants; therefore, for most choirs, /s/ and /z/ will need to be deemphasized. The prevailing choral issue will almost always be the rhythmic unification and duration of s’s and z’s.

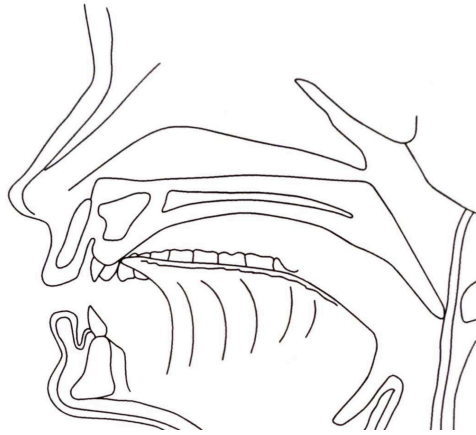
The combination of hiss and buzz produced by the voiced alveolar fricative /z/ makes it a popular device for building focused tone. The intense airstream flowing through a narrow constriction at the front of the mouth establishes a forward focal point for the breath. The timbral buzz creates a vivid sound quality in the singer’s ear, which has a strong impact on ensuing vowels. /s/ and /z/ may be paired with vowels to help correct throaty, muffled, or breathy singing.

⁴⁸ Miller, *Structure of Singing*, 98.

⁴⁹ A table describing the various types of lisps can be found in: LaBouff, *Singing and Communicating in English*, 147.

Post-Alveolar (Palato-Alveolar) Fricatives

Figure 21. Midsagittal view of articulation during /ʃ, ʒ/.⁵⁰



/ʃ/ unvoiced post-alveolar fricative

/ʒ/ voiced post-alveolar fricative

Tongue	sides press against the upper back teeth, grooved dorsum directs air toward tip, blade in near contact with the back of the alveolar ridge
Lips	slightly rounded
Jaw	raised to a half-closed position
Velum	elevated

Tongue shape for the articulation of post-alveolar fricatives is similar to the shape for /s/ and /z/; the sides of the tongue press against the upper back teeth to direct air toward the tip of the tongue. The primary difference is the place of articulation. The narrow constriction is further back for /ʃ/ and /ʒ/. The blade of the tongue comes into near contact with posterior region of the alveolar ridge.⁵¹ A raised velum strengthens the airstream by blocking off the nasopharyngeal port. The lips round slightly and act as an acoustical filter in front of the constriction. The spectral properties of /ʃ/ and /ʒ/ are not as

⁵⁰ LaBouff, *Singing and Communicating in English*, 154. Figure 21 does not show the pursing of the lips.

⁵¹ Ladefoged and Johnson, *A Course in Phonetics*, 12. Ladefoged and Johnson claimed that /ʃ/ and /ʒ/ could be articulated with either the tip or the blade.

powerful as /s/ and /z/, but they are more pronounced than the other consonants so rhythmic unification and exact duration is crucial in choral contexts.⁵²

The post-alveolar fricatives are not particularly beneficial for the purposes of choral voice building because their pedagogical uses can be accomplished more effectively through other consonants. The constriction between the tongue and alveolar ridge in /ʃ/ and /ʒ/ is larger than the constriction found in /s/ and /z/, therefore, they expel more air than the post-alveolars, which makes them less useful as breath resistance devices. The grooved tongue shape and post-alveolar placement is a demanding position for the tongue. (The only consonants that position the tip of the tongue further away from its resting position are the retroflex consonants.) Lip rounding, albeit slight, becomes fatiguing and tension-inducing when used repetitively. /ʒ/ does not generate vibratory sensations as prominently as /z/ or /v/. For these reasons, /ʃ/ and /ʒ/ should be used with caution in exercises.

Post-alveolar fricatives are more favorable when preceded by plosives to form affricates. An **affricate** is a sequence of a plosive followed by a **homorganic** fricative—or a fricative having the same place of articulation⁵³—that is perceived as a single unit. The English word “cheap” is transcribed as /tʃip/, and the voiced equivalent “jeep” is transcribed as /dʒip/. /t, d/ is the plosive portion and /ʃ, ʒ/ is the fricative portion, but together they are perceived as a single consonant. The initial plosive brings the tip of the tongue to a more favorable position (anterior alveolar ridge). The blade is flattened rather than grooved. Lip rounding occurs hardly at all, except for anticipatory coarticulation for

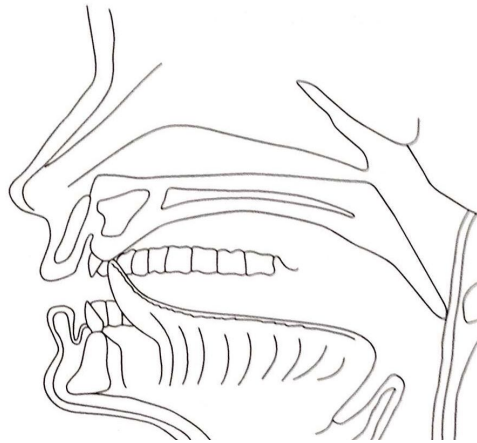
⁵² Reetz and Jongman, *Phonetics*, 191. “Alveolar /s, z/ are produced with a shorter anterior cavity [in front of the point of constriction] than /ʃ, ʒ/ and therefore display a primary spectral peak at higher frequencies.”

⁵³ Ladefoged and Johnson, *A Course in Phonetics*, 63-67.

a rounded vowel. The fricative occurs only as a rapid transitional sound and its shortcomings are minimized.

Lateral Approximant

Figure 22. Midsagittal view of articulation during /l/.⁵⁴



/l/ voiced lateral approximant

Tongue	tip contacts the anterior alveolar ridge and upper incisors; blade and body flattened
Lips	neutral
Jaw	neutral
Velum	elevated

During lateral approximant production, the tip of the tongue contacts the alveolar ridge but the lateral margins do not seal against the back teeth as they do in /t, d, n/. “A small pocket of air remains above the tongue body while air escapes on either side of the constriction.”⁵⁵ The neutral lips and jaw are free to form anticipatory coarticulations. The velum will elevate to prevent nasality.⁵⁶

⁵⁴ LaBouff, *Singing and Communicating in English*, 180.

⁵⁵ Reetz and Jongman, *Phonetics*, 197.

⁵⁶ Miller, *Structure of Singing*, 91. Miller recommends occasional nostril occlusion while singing /l/ to monitor the closure of the nasopharyngeal port.

This articulatory configuration divides the vocal tract into a “main tube” and a “side tube.” The following passage from Reetz and Jongman discusses the resultant formant spectrum:

The main tube extends from glottis to mouth opening while the pocket of air is modeled as a short side tube.

The coupling between these two tubes ... results in anti-formants. Formants from the side tube will cancel out formants from the main tube. Since the side tube is short, the anti-formant will be relatively high, at approximately 2,000-2,300 Hz for an adult male.⁵⁷

This supports /l/’s value as a resonance balancing consonant. It also reveals the acoustical difference between the darker sounding English /l/ found in the words “full,” “help,” and “little,” and the clearer sounding Italian /l/. The dark English /l/ is known as *velarized l* and receives the diacritic [~] in narrow transcription: [ɫ̠]. It is produced with more intrinsic tongue muscle constrictions, especially in the lateral margins, and the tongue body is raised toward the velum.⁵⁸ The narrow tongue shape, posterior placement of the tip, and raised tongue body lowers the formants of the side tube.⁵⁹ The Italian /l/ is produced with a flatter tongue blade, a more anterior placement of the tip, and a lower tongue body which reinforces the higher formants of the short tube. It is widely agreed that the forward, dental /l/ has better carrying power and it supports resonant singing.

The properly articulated /l/ may serve as a keystone consonant (see pg. 17) because it can be used to acquire “facile tongue action, the key to good articulation.”⁶⁰ Young singers benefit greatly from drills and exercises that incorporate /l/ because they learn the ideal tongue placement for alveolar articulation, and the tip of the tongue can

⁵⁷ Reetz and Jongman, *Phonetics*, 197-98.

⁵⁸ Ibid., 42.

⁵⁹ Stevens, *Acoustic Phonetics*, 545-46.

⁶⁰ Miller, *Structure of Singing*, 92.

easily return to its resting position after the release of /l/. A properly articulated /l/ works efficiently with vowels because it does not disrupt the breath as drastically as plosives, fricatives, or nasal continuants. It can be articulated between open vowels without jaw movement. The improperly articulated /l/ aggravates tongue tension and diminishes overall resonance. In Miller’s words, “A sluggish /l/ destroys all hope for good diction.”⁶¹

Rs

When r’s are encountered in lyric diction for English and Latin, pedagogues recommend three primary forms of consonant articulation: (1) voiced alveolar trill [r], (2) voiced alveolar tap [ɾ], and (3) voiced alveolar frictionless continuant [ɹ]. Standard application and aesthetic preferences for the r-variants change over time and vary between teachers.⁶² Even phonetic transcription is inconsistent in the literature. For example, in transcribing the voiced alveolar trill, Miller used [ř], LaBouff used [R], Wall and Caldwell used [r̄], but modern IPA standards call for [r].

Voiced Alveolar Trill

[r] voiced alveolar trill

Tongue	tip vibrates against the alveolar ridge
Lips	neutral
Jaw	neutral
Velum	elevated

⁶¹ Miller, *Structure of Singing*, 92.

⁶² Additionally, r’s can sound as vowels /ɜ, ə/, r-colored vowels /ɜ̃, ə̃/, and foreign speech sounds /R, ʁ/. Guidance for r-variants can be found in: Leslie De’Ath, “Phonetic Transcription—What It Doesn’t Tell Us,” *Journal of Singing* 70, no. 1 (September/October 2013), 59-74; LaBouff, *Singing and Communicating in English*; Wall and Caldwell, *Diction*, 19-21.

For the voiced alveolar trill [r], commonly referred to as trilled or rolled r, the tip of the tongue is positioned in close proximity to the alveolar ridge and set into vibratory motion by aerodynamic force.⁶³ “This sound may be difficult to produce if it has not been learned during childhood, since the tongue tip must be tensed to reach the alveolar ridge but must also be relaxed enough to ‘flutter’ in the air”⁶⁴ For singers, successful production of the alveolar trill is an important technical device that promotes flexibility in tongue musculature and laryngeal musculature.

The alveolar [r], along with lip trills [ʙ] and raspberries, classifies as an oscillatory semioccluded posture and realizes benefits similar to voiced fricatives (see pg. 70-71).⁶⁵ A common device used in studio teaching and choral warm-ups is to sustain [r] on pitch patterns or actual phrases extracted from repertoire. This technique is widely effective because it establishes balance between the respiratory system, the laryngeal vibration, and tongue vibration. The coordination of three separate systems whose complexity often confuses young singers is made simple by presenting a singular task: sustain the trill. Titze explained this phenomenon in the following passage from an article titled “Lip and Tongue Trills—What Do They Do For Us?”:

... we recognize that there are two sources of vibration in this trill, one in the larynx and one in the front of the mouth ... we know that the aerodynamic power available for this dual vibration is the lung pressure multiplied by the mean airflow produced (power = pressure x airflow). The main airflow is the same at the glottis as the [tongue]; otherwise, our cheeks or neck would bulge out. The only difference, then, between the power that is given to the two vibrators is the relative amount of pressure dropped across each of them. If the lung pressure is constant, then more pressure across one means less pressure across the other ... because physical law dictates that the pressure across the lips plus the pressure across the vocal folds must equal the lung pressure.

⁶³ Ladefoged and Johnson, *A Course in Phonetics*, 175.

⁶⁴ Reetz and Jongman, *Phonetics*, 57.

⁶⁵ Nix and Simpson, “Semi-Occluded Vocal Tract Postures,” 339.

Quite naturally, the vocalist learns how to budget the pressures appropriately to keep both the lips and the vocal folds vibrating ...⁶⁶

Only a few drawbacks are associated with [r]. Depending on the composer, style, era, and language, [r] may be deemed inappropriate for a given phonetic environment especially since [r] does not naturally occur in spoken English.⁶⁷ Successful production of [r] does not ensure acquisition of vocal technique, so directors should be careful to not overstate its value or assume its effectiveness. Although not likely, it is possible to produce [r] with unwanted muscular tension. Directors must remain attentive to the actual sounds of their choirs and the ways in which [r] helps and hinders vocal production on a given occasion.

Voiced Alveolar Tap

[r] voiced alveolar tap

Tongue	tip taps the alveolar ridge
Lips	neutral
Jaw	neutral
Velum	elevated

The voiced alveolar tap is produced when a muscular contraction draws the tip of the tongue to the alveolar ridge for a single tap. The tap is a rapid closure that is shorter than a plosive.⁶⁸ The phoneme occurs in common American speech pronunciation of the /t/ in the word “latter” (narrowly transcribed as [lætɾ]). All other articulatory structures remain neutral during the alveolar tap, assuming that velar elevation is employed in surrounding vowels.

⁶⁶ Ingo R. Titze, “Lip and Tongue Trills—What Do They Do For Us?” *Journal of Singing* 52, no. 3 (January/February 1996), 51.

⁶⁷ Guidelines for modern usage in British Received Pronunciation and General American English Pronunciation can be found in: LaBouff, *Singing and Communicating in English*, 231-35.

⁶⁸ Reetz and Jongman, *Phonetics*, 57.

Some phoneticians use the terms “tap” and “flap” interchangeably (while some diction texts call it a “flip”), but Ladefoged and Johnson distinguish the flap as having a retroflex gesture—the tip of the tongue curls up and back to contact the post-alveolar region.⁶⁹ The retroflex diacritic may be used to distinguish the phonetic difference (e.g. [ɾ]). Since anterior alveolar placement has been found to be more conducive to good singing, the *tap* is the preferred manner of articulation.

The tongue gesture for the voiced alveolar tap is highly useful for vocal development because it requires agile and accurate tongue movement. Rigidity in the tongue or jaw results in a /t/ or /d/ plosive rather than a fleeting tap. [ɾ] taps only occur intervocalically in English and Latin, and they should only be used intervocalically in exercises. They are useful for practicing the tongue tip’s quick return to its resting position. If the proper amount of looseness is achieved in an intervocalic [ɾ], the tip is very likely to fall naturally into place behind the lower incisors on ensuing vowels.

Voiced Alveolar Approximant

[ɹ] voiced alveolar approximant

Tongue	tip approaches the middle of the alveolar ridge
Lips	neutral
Jaw	raised to a half-closed position
Velum	elevated

The voiced alveolar approximant [ɹ] is the most common pronunciation of /r/ in General American English. It occurs naturally in GA pronunciation of “rye,” “earth,” and “rural.” It is produced when the tip of the tongue approaches the middle of the alveolar ridge but does not come close enough to create friction (as in the turbulent noise found in /ʒ/). The exact place of articulation along the alveolar ridge varies, but when formed in

⁶⁹ Ladefoged and Johnson, *A Course in Phonetics*, 176.

the post-alveolar region, the tip of the tongue curls up and back resulting in a retroflex articulation. The “bunched tongue” formation is perhaps the most detrimental articulation to classical singing technique because it “contributes more to vowel distortion than any other phoneme in Western Languages.”⁷⁰ The “retroflex *r*” is transcribed using the symbol [ɭ] which recognizes a subtle yet important phonetic difference from [ɹ]. When trilled [r] and tapped [ɾ] result in an unwanted affected sound, [ɹ] may be used as an alternative, but [ɭ] should be avoided because it requires the most tongue tensing.

Historically, [ɹ] has been disregarded as a pedagogical tool, but its increasing acceptance and usage in applied performance warrant consideration. The articulatory configuration for [ɹ] introduces an “acoustic side branch”⁷¹ produced in the front-cavity underneath the tongue. This creates an “extra resonance in the frequency range normally occupied by F₂. The characteristic acoustic pattern is a pair of spectral peaks in this F₂ range.”⁷² This concentrated energy in the F₂ range challenges the notion that [ɹ] destroys balanced resonance. A detrimental effect on resonance is usually a result of poor articulation in surrounding vowels and sluggish transitions not the consonant itself—a muscular failure rather than an acoustical interference. Sustained [ɹ] produces strong overtones. It may be used to help singers experience and hear energized frequencies above the fundamental. If proper tongue placement can be quickly achieved in vowels surrounding [ɹ], it may be possible to encourage resonance in surrounding vowels.

⁷⁰ Miller, *Structure of Singing*, 95.

⁷¹ Stevens, *Acoustic Phonetics*, 541.

⁷² *Ibid.*, 541.

Nasals

Nasal consonants /m, n, ŋ/ are produced when a complete occlusion in the oral cavity is combined with a lowered velum during phonation. Their manner of articulation is a stop because of the oral obstruction, hence, the term *nasal stop*, but broader classifications—‘nasal continuants’ or ‘nasal sonorants’—are more appropriate for singing. Unlike stop-plosives, intraoral pressure does not increase behind the constriction in nasal stops and there is no explosive release.⁷³ Continuous sound resonates at a relatively constant level in two resonating chambers: the nasal cavity (primary) and the oral cavity (secondary).

Teachers, especially choral directors, commonly use the nasal continuants in exercises directed towards the development of forward resonance. Miller said the nasals could be highly effective in increasing students’ awareness of vibratory sensations in the nasal and sinus areas.⁷⁴ Those sensations often encourage greater resonance in succeeding vowels.

The caveat to this approach is that nasality often assimilates to surrounding vowels. Because the velum is the slowest moving articulator, the nasopharyngeal port often remains open during the transitions between nasal consonants and vowels. While many pedagogues argue that the velopharyngeal port should be completely closed in non-nasal vowel production, the port “cannot be compared to a simple ‘gate’ that is lowered or raised.”⁷⁵ “Nasalance” was found to be the “the percentage of airflow through the nasal tract in relation to the oral airflow,” which can be high, low, or something in

⁷³ Stevens, *Acoustic Phonetics*, 489.

⁷⁴ Miller, *Structure of Singing*, 80.

⁷⁵ Reetz and Jongman, *Phonetics*, 86-87.

between; not merely 0% or 100%.⁷⁶ Nasalance varies from vowel to vowel and it is highly influenced by velar positioning for consonants. In rapid alternations (e.g. /miŋ miŋ miŋ/ and /nɛi nɛi nɛi/), the “lag and lead” of the velum can cause the entire vowel to be nasalized.⁷⁷ Frequent use of such exercises conditions the musculature and often results in a habitually lowered velum. Recognizing this danger, Miller suggested occluding the nostrils with the fingers during surrounding vowels as a tactic to monitor nasality.⁷⁸ If high nasality persists in the vowel, the nostril occlusion will significantly alter its timbre giving the student direct feedback about his or her tone production.

Miller found the nasals to be helpful in relieving tension in different articulatory structures. Many students who have misconceptions about spaciousness and resonance suffer from excessive laryngeal depression, jaw depression, velum elevation, and tenseness in the pharynx.⁷⁹ They overexert these structures in attempt to make as much space as possible. In these cases, the nasals may be able to help students to generate focused tone while relaxing the areas of tension.

⁷⁶ Reetz and Jongman, *Phonetics*, 86-87.

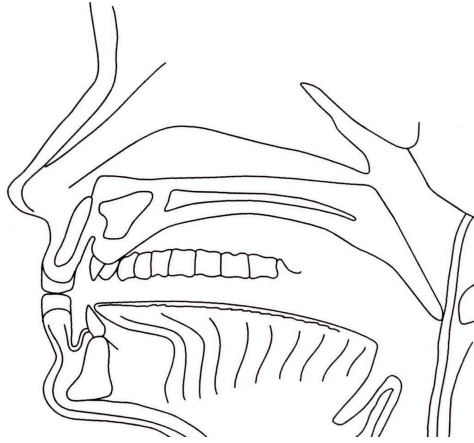
⁷⁷ J. M. Pickett, *The Sounds and Speech of Communication: A Primer of Acoustic Phonetics and Speech Perception*, (Baltimore, MD: University Park Press, 1980), 126.

⁷⁸ Miller, *Structure of Singing*, 81-82; Vennard, *Singing: The Mechanism and the Technique*, 94.

⁷⁹ Miller, *Structure of Singing*, 88.

Bilabial Nasal Stop

Figure 23. Midsagittal view of articulation during /m/.⁸⁰



/m/ voiced bilabial nasal stop

Tongue	neutral
Lips	occluded
Jaw	elevated
Velum	lowered

The voiced bilabial nasal stop is articulated with a complete occlusion at the lips that stops airflow through the mouth. As with the bilabial plosives, lip closure should be firm but without excessive tension. The primary distinction between articulation for /m/ and the bilabial plosives is that the velum lowers to allow air to pass through the nasal cavity. There is no increase in air pressure behind the constriction nor is there any trace of turbulent noise. One can practice conscious manipulation of the velum by alternating between silent *m* and silent *p* positions.

Sung /m/ utilizes the entire oral cavity as a resonance chamber (in addition to the pharynx, nasal cavity, and sinuses), therefore, it is the nasal consonant most similar to the

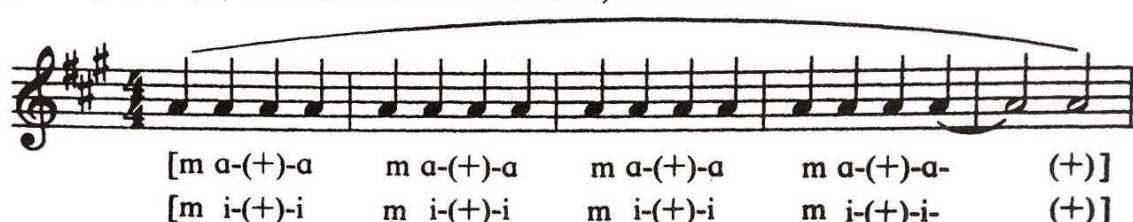
⁸⁰ LaBouff, *Singing and Communicating in English*, 168. Figure 23 incorrectly shows an elevated velum blocking the nasopharyngeal port. The velum must be lowered in order for the air to flow through the nasal cavity.

sensation of vowel production. The tongue is not involved in the oral obstruction so it is free to anticipate vowel formation. The strategy of preparing the mouth shape ahead of time (e.g. the popular instruction: “Breathe on the vowel!”) can be practiced easily with an initial /m/ because the lip closure does not—or *should* not—interfere with the tongue.

Miller gave careful thought to the risks of using /m/ in vocal exercises. He said when sustaining the /m/, “the quality of the sound is nasal. When the lips are parted, no continuance of actual nasality should be present in the tone, but the same *sensation* should pertain in the nasal and sinusal areas (sympathetic resonance experienced by the singer largely through bone and cartilage conduction).”⁸¹ He advised singers to use periodic nostril occlusion to monitor nasality in neighboring vowels. Figure 24 illustrates his method.

Figure 24. Miller’s resonance balancing exercise with /m/ and notated nostril occlusions.

(The symbol (+) indicates occluded nostrils.)



BEGIN WITH THE HUM ([m]) AS IN EXERCISE 6.1. ADDITIONALLY, BEATS ARE INTRODUCED, DURING WHICH TIME THE NOSTRILS ARE CLOSED BY THE FINGERS (INDICATED IN EXERCISE 6.2 BY THE SYMBOL [(+)]), THEN ALLOWED TO REOPEN WITH NO CHANGE IN VOCAL QUALITY. THIS IS TO ENSURE THAT THE VELUM DOES NOT INTERFERE WITH THE PROPER COUPLING OF NASOPHARYNX AND ORAL CAVITIES IN THE QUICK CHANGE FROM [m] TO [a] (OR [i]). BEAT 1 OF EACH BAR IS DEVOTED TO [m], BEAT 2 TO [a]; BEAT 3 [(+)] CHECKS THE DEGREE OF RESONANCE BALANCE BY LIGHTLY PINCHING THE NOSTRILS CLOSED WHILE CONTINUING TO SING [a]; BEAT 4 RETURNS TO THE UNOCCLUDED NOSTRILS. NO QUALITY CHANGE SHOULD BE EXPERIENCED BETWEEN BEATS 2, 3, AND 4.

⁸¹ Miller, *Structure of Singing*, 81.

Miller used long sustained notes so that the singer had enough time to compare each sensation, one being the sensation of nasal resonance on nasal consonants due to air and sound flowing through the nose, and the other being the sympathetic vibrations in the nasal area during non-nasal vowels. If this distinction is not made and reinforced on a regular basis, students will unknowingly equate an open nasopharyngeal port with high resonance.

Additional uses of /m/ include relieving singers of tension in the jaw and velum. Some singers, in attempt to manufacture spaciousness and resonance, suffer from jaw depression and excessive velum elevation which creates tension in the pharyngeal walls and raises the larynx. The /m/ may be used to relieve the jaw and velum from these extreme positions.

Voiced Alveolar Nasal Stop

/n/ voiced alveolar nasal stop

Tongue	tip contacts the alveolar ridge
Lips	neutral
Jaw	neutral
Velum	lowered

The voiced alveolar nasal stop is produced with the tip of the tongue held against the alveolar ridge. The lateral margins of the tongue body press against the back teeth to form a complete seal around the roof of the mouth. As with all nasal stops, the velum is lowered to allow air to move through the nasal cavity; this differentiates /n/ from /t, d/.

The vibratory sensations felt during /n/ production are located higher, “in the region of the upper jaw and maxillary sinuses.”⁸² For singers who seem to produce /m/ and succeeding consonants with an overly dark, muffled, or throaty tone, /n/ may serve as a preferred alternative to /m/. The tongue directs energy toward the alveolar ridge, focusing tone and vibrations in the frontal region.

According to a report by Jean Westerman Gregg, “*n* is the second most frequently occurring consonant (6.12%)” in English, second only to *t* (6.60%).” Its articulation is nearly identical to /t, d, l/, alveolar consonants which have been identified as important consonants for developing facile tongue action. The vibratory sensations in the *masque* are felt between the extremes of /m/ and /ŋ/. For these reasons, /n/ qualifies as perhaps the most useful nasal continuant for developing articulation and resonance.

Voiced Velar Nasal Stop

/ŋ/ voiced velar nasal stop	
Tongue	center/back of tongue body contacts the velum and/or the back of the hard palate
Lips	neutral
Jaw	neutral
Velum	lowered

As was found in the production of velar plosives, the place of articulation for the voiced velar nasal stop /ŋ/ depends on coarticulation of surrounding vowels. In English words, /ŋ/ only appears in final positions (e.g. “sing”) or in syllabic junctures (e.g. “longing”), therefore it usually experiences **progressive coarticulation**—the articulatory influences of earlier sounds on later sounds.⁸³ When preceded by a front vowel such as in

⁸² Miller, *Structure of Singing*, 84.

⁸³ Reetz and Jongman, *Phonetics*, 39.

the word “sing” (/sɪŋ/), the articulation is more anterior with the center of the tongue body contacting the back of the hard palate. When preceded by a back vowel such as in the word “song” (/sɒŋ/), the back of the tongue body contacts the velum. /ŋ/ is often used to initiate syllables in vocal exercises, and in that event, anticipatory coarticulation occurs. No matter what vowel surrounds /ŋ/, the tip of the tongue should rest behind the lower teeth.⁸⁴ The position of the tip has little effect on /ŋ/, but any extraneous movement burdens overall tone production.

The velar nasal /ŋ/ has the most posterior constriction of all the nasals. “The shorter the posterior part of the oral cavity—that is, the further back (more posterior) the place of articulation—the higher the resonances ...”⁸⁵ As a result, it produces intense vibrations high in the *masque*, sensations typically associated with the singer’s formant, which has made it appealing as a quick fix for finding resonance.⁸⁶ The distinction between healthy resonance and nasality, as previously discussed, must be emphasized when utilizing [ŋ] because its high intensity can mislead singers into thinking they have acquired a technique for enhancing resonance. A balance of nasalance (preferably at a low percentage for non-nasal vowels) must be reached by carefully coordinating the structures of articulation. Ultimately, a skilled teacher’s ear is the best guide for accomplishing this, but knowledge of the structures and their configurations helps the

⁸⁴ Jean Westerman Gregg, “What About Humming with the *ng*?” *Journal of Singing* 54, no. 4 (March/April 1998), 56; John Nix, “Lip Trills and Raspberries: ‘High Spit Factor’ Alternatives to the Nasal Continuant Consonants,” *Journal of Singing* 55, no. 3 (January/February 1999), 16. Gregg and Nix found that habitual tongue retraction was commonly associated with /ŋ/ production.

⁸⁵ Reetz and Jongman, *Phonetics*, 195.

⁸⁶ Miller, *Structure of Singing*, 85.

teacher to process the sounds accurately and devise an appropriate, well-informed solution.

CHAPTER 5: EXERCISES

The following exercises are designed for the development of proper coordination between the systems of articulation and resonance. They are intended for intermediate-advanced collegiate choirs or choirs whose singers have already acquired fundamental skills in vowel production. They are presented systematically to demonstrate a way of using consonants with purpose and in conjunction with vowels. The skills gained from these exercises, especially the improved articulatory habits, will better equip choristers to meet the vocal challenges encountered in repertoire.

Basic Exercises

Descending five-note scales beginning with an initial consonant may be used to teach fundamental concepts for proper consonant production. All consonants examined in Chapter 4 may be studied using this Exercise 1, with the exception of the alveolar tap [ɾ] which should only be used intervocally. The /i a/ vowel combination is recommended because:

- /i/ helps to position the tip of the tongue behind the lower incisors.
- /i/ does not require lip rounding such as in the anticipatory coarticulation caused by /u/.
- proper execution of /i/ will likely lead to proper placement of the tongue tip for /a/.

Other vowels may be substituted for /i a/ if the director finds that the choir's sound is overly bright, forward, thin, or tense.

Exercise 1



unvoiced plosive:	/ ti_____	a_____	/
voiced plosive:	/ di_____	a_____	/
approximant:	/ li_____	a_____	/
voiced fricative:	/ vi_____	a_____	/
nasal:	/ mi_____	a_____	/
affricate:	/ tʃi_____	a_____	/

Once proper production of a given consonant is learned, consistency may be developed by prefacing the descending five-note scale with repeated consonant onsets. Different CV (consonant-vowel) combinations may be gradually introduced. Exercise 2.1 progresses through front vowels /i, ɛ, a/ and Exercise 2.2 progresses through back vowels /u, o, a/.¹

Exercise 2.1



/ ti	tɛ	ta_____	/
/ di	dɛ	da_____	/

Exercise 2.2



/ tu	to	ta_____	/
/ du	do	da_____	/

Exercise 3.1 targets precise and rapid articulation of consonants within a sustained line. Here, the *bel canto* principle of prolonging vowels as long as possible and executing

¹ The plosives /t/ and /d/ are shown in Exercise 2.1–Exercise 4 but they should be substituted to exercise other consonants.

consonants as quickly as possible should be followed to maintain balanced resonance.

Exercises 1–2.2 focused on developing a quick transition from consonant to vowel.

Practicing consonants in intervocalic position (VCV) develops articulatory flexibility for the *approach* to the consonant as well as the *departure* from the consonant to the vowel.

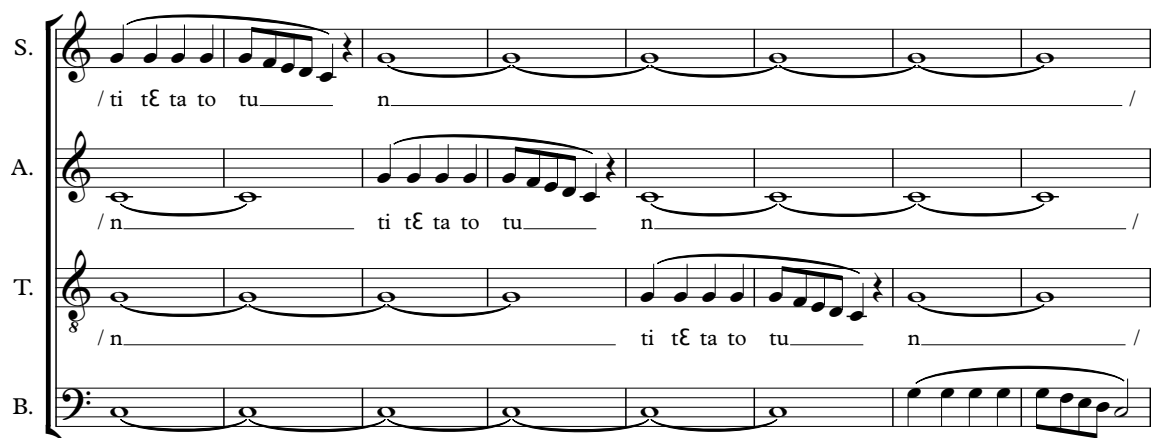
Exercise 3.1



Exercise 3.1 is a single melodic line on a treble clef staff. It consists of a sequence of eighth notes: C4, D4, E4, F4, G4, A4, B4, C5, B4, A4, G4, F4, E4, D4, C4. A slur covers the first seven notes, and another slur covers the last four notes. Below the staff, the lyrics are: / ti - tɛ - ta - to - tu_____ / and / di - dɛ - da - do - du_____ /.

The exercise above may be performed against open-fifth drones sustained by other voice parts to develop pure choral intonation (Exercise 3.2). Unification of rhythm and vowel should be an underlying goal for every exercise. Singing against vocal drones is one of the simplest and most effective ways to develop this because it demands sensitive listening from every chorister.

Exercise 3.2



Exercise 3.2 is a four-part setting for Soprano (S.), Alto (A.), Tenor (T.), and Bass (B.). Each part has a treble clef except for the Bass part which has a bass clef. The Soprano part starts with a slur over the first seven notes (C4-G4) and then has a long note (C4) with a slur. The Alto part starts with a long note (C4) with a slur, followed by a slur over the next seven notes (D4-G4), and then a long note (C4) with a slur. The Tenor part starts with a long note (C3) with a slur, followed by a slur over the next seven notes (D3-G3), and then a long note (C3) with a slur. The Bass part starts with a long note (C2) with a slur, followed by a slur over the next seven notes (D2-G2), and then a long note (C2) with a slur. Below each staff, the lyrics are: / ti tɛ ta to tu_____ n_____ / for Soprano, / n_____ ti tɛ ta to tu_____ n_____ / for Alto, / n_____ ti tɛ ta to tu_____ n_____ / for Tenor, and / n_____ ti tɛ ta to tu_____ / for Bass.

Exercise 4 can be used as an aid for choirs that have difficulty maintaining a *legato* line between vowels and consonants. The circular pitch pattern is first sung on a

vowel to establish the desired sound quality. It is repeated with medial *l*'s, the least vocally intrusive consonant (see pg. 81-82), and then repeated once more with insertions of the target consonant.

Exercise 4



Consonant Gemination and Final Releases

Exercise 5 introduces **consonant gemination**, or prolongation indicated by the diacritic [:]. Too often in choral singing, directors demand exaggerated, pressurized, or louder consonants. Consonant gemination is a valuable technique that produces a phonetic stress without extra exertion of vocal force. Solo singers are able to use it freely because they are in charge of their own rhythms of enunciation. Choral directors tend to avoid gemination because they find it too difficult to unify. That is only true for choirs that do not commit to the rhythmic integrity of every phonetic event. Exercise 4 is designed to develop the skill that steals a rhythmic portion of the preceding vowel (as described by Shaw). For the gemination of fricatives, nasals, approximants, and Rs, the consonant is sustained. For the gemination of plosives, the *closure interval*, or the time that passes as the obstruction is held (see pg. 60), is prolonged.

Final releases of consonants at the ends of phrases frequently go unheard when they are performed with speech habits. In speech, final plosives are typically unreleased (e.g. the *p* in “stop” [stɒp̚]). Other consonants suffer from a dramatic drop in phonatory and/or breath intensity. Heightened clarity of final consonant releases can be

accomplished by using “shadow vowels” (indicated by a small [ə]) or gemination for voiced consonants, or aspiration for unvoiced consonants (indicated by a small [h]).

Exercise 5

Unvoiced Plosive Example:

[ti tɛ ta to t̥ tu tʰ]

[ti tɛ ta toṯ tu tʰ]

Voiced Plosive Example:

[di dɛ da do d̥ du dʰ]

[di dɛ da doṯ du dʰ]

Approximant Example:

[li lɛ la lo l lu lʷ]

[li lɛ la loṯ lu lʷ]

Unvoiced Fricative Example:

[fi fɛ fa fo f fu fʰ]

[fi fɛ fa fof fu fʰ]

Voiced Fricative Example:

[vi vɛ va vo v vu vʷ]

[vi vɛ va vov vu vʷ]

Exercise 6 presents alternative rhythmic divisions for consonant gemination.

Rhythmic distribution of phonemes in repertoire depends on the tempo of the piece, the note value of the syllable preceding the geminated consonant, and the aesthetic preferences of the director.²

Exercise 6

The exercises show four different rhythmic patterns for the syllables /ta/ and /da/. Each pattern is represented by a staff with notes and phonetic labels. The labels are: [ta _____ ta _____ ta _____] and [da _____ da _____ da _____]. The notes are: / ta ta ta / and / da da da /.

Exercise 1 (top left): Shows a rhythmic pattern with three notes. The labels are: [ta _____ ta _____ ta _____] and [da _____ da _____ da _____]. The notes are: / ta ta ta / and / da da da /.

Exercise 2 (top right): Shows a rhythmic pattern with three notes. The labels are: [ta _____ ta _____ ta _____] and [da _____ da _____ da _____]. The notes are: / ta ta ta / and / da da da /.

Exercise 3 (bottom left): Shows a rhythmic pattern with three notes. The labels are: [ta _____ ta _____ ta _____] and [da _____ da _____ da _____]. The notes are: / ta ta ta / and / da da da /.

Exercise 4 (bottom right): Shows a rhythmic pattern with three notes. The labels are: [ta _____ ta _____ ta _____] and [da _____ da _____ da _____]. The notes are: / ta ta ta / and / da da da /.

Controlled Aspiration

Exaggerated consonants often result in high degrees of aspiration. Aspiration expels air, results in breathy tone due to habitual vocal fold abduction, and has a diminishing effect on overall resonance. The difference between aspirated and unaspirated plosives may be introduced using the following model words:

Aspirated Plosives

The /p/ in “pie.” [p^haɪ]
 The /t/ in “team.” [t^him]
 The /k/ in “cat.” [k^hæt]

Unaspirated Plosives

The /p/ in “spy.” [spaɪ]
 The /t/ in “steam.” [stim]
 The /k/ in “scat.” [skæt]

² The plosives /t/ and /d/ are shown in Exercise 6 but they should be substituted to exercise other consonants.

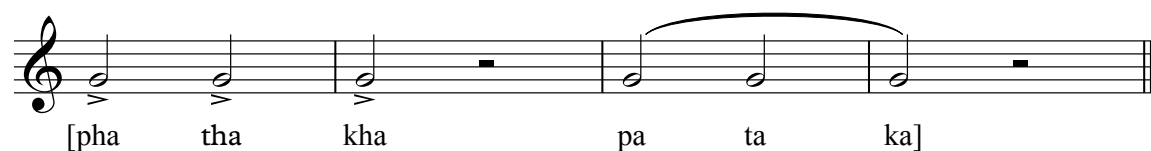
Use Exercise 7.1 to bring attention to the difference between aspirated and unaspirated consonants.

Exercise 7.1



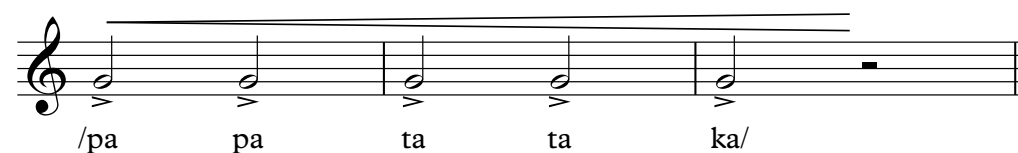
If necessary, ask the singers to insert an audible *h* for the aspirated consonants, and to make the *p*, *t*, and *k* of the unaspirated consonants as close to *b*, *d*, and *g* as possible. Use the Exercise 7.2 to make the distinction more obvious but refrain from repeating it any more than is necessary.

Exercise 7.2



Exercises 8.1 and 8.2 should be used to focus on the balance between articulation and resonance. As vocal intensity and amplitude increases in the crescendo, singers must learn to execute vowels and consonants without excessive pressure.

Exercise 8.1



Exercise 8.2

transpose accordingly

S.
A.

/pa pa ta ta ka/

T.
B.

Detailed description: This musical score is for a Soprano (S.) and Alto (A.) duet. The Soprano part is written on a treble clef staff, and the Alto part is on a bass clef staff. Both parts start with a key signature of one sharp (F#) and a common time signature (C). The Soprano part has a melodic line with five notes: a half note G4, a quarter note A4, a quarter note B4, a quarter note C5, and a half note D5. The Alto part has a harmonic line with five notes: a half note G3, a quarter note A3, a quarter note B3, a quarter note C4, and a half note D4. The lyrics are written below the Soprano staff: "/pa pa ta ta ka/". Above the Soprano staff, there is a bracket with the text "transpose accordingly".

As discussed above, gemination to make plosives audible in vocal music involves lengthening the *closure interval*. This emphasizes the release of the consonant by separating it from a preceding vowel. The brief silence between the preceding vowel and the plosive release enhances intelligibility. When gemination alone does not sufficiently produce an audible plosive (especially in thick textures, loud dynamics, or in choral-orchestral settings) the singers should emphasize the *release* with a controlled burst of energy. To develop this skill, singers should begin with long closure intervals (Exercise 9.1) to focus on stopping the sound without using excessive muscular tension or breath pressure. The burst should be energized but concise so that the vowel sounds immediately and without breathiness. Shorter closure intervals are given in Exercise 9.2.

Exercise 9.1

firm closure, without excessive pressure

/pa pa pa ta ta ta ka ka ka/

[pa p̄ pa p̄ pa ta t̄ ta t̄ ta ka k̄ ka k̄ ka]

Detailed description: This musical score is for a Soprano (S.) and Alto (A.) duet. The Soprano part is written on a treble clef staff, and the Alto part is on a bass clef staff. Both parts start with a key signature of one sharp (F#) and a common time signature (C). The Soprano part has a melodic line with five notes: a half note G4, a quarter note A4, a quarter note B4, a quarter note C5, and a half note D5. The Alto part has a harmonic line with five notes: a half note G3, a quarter note A3, a quarter note B3, a quarter note C4, and a half note D4. The lyrics are written below the Soprano staff: "/pa pa pa ta ta ta ka ka ka/". Above the Soprano staff, there is a bracket with the text "firm closure, without excessive pressure". Below the Soprano staff, there is a bracket with the text "[pa p̄ pa p̄ pa ta t̄ ta t̄ ta ka k̄ ka k̄ ka]".

Exercise 9.2

/pa pa pa ta ta ta ka ka ka/

[pa p̃ pa p̃ pa ta t̃ ta t̃ ta ka k̃ ka k̃ ka]

Exercise 10 contains a set of drills harmonized for SATB chorus. It should *not* be sung from beginning to end. Rehearsal letters are included to make excerpting possible. Choirs should focus on one or two exercises at a time. Each exercise can be easily memorized, which allows singers to concentrate on clear, unified articulation. Equal attention should be given to vowel unification, resonance, balanced harmonies, and excellent intonation. Examples of possible uses are given below:

- Beginning in Bb major (down one whole step), sing **G** transposing up with every repetition.
- Beginning in Bb major, sing **B** transposing up with every repetition. After several repetitions, reset the key to Bb major and sing mm. **C** transposing up with every repetition.
- Establish D major. Using the voiced /d/ only, alternate between **D** and **F**. Compare the quick consonants of *legato* singing with the longer consonants in *marcato* singing. Maintain the integrity of the vowel with every repetition.

Exercise 10. Choral drills for plosive articulation. Transpose accordingly.

Very quick plosives Long closure intervals Short closure intervals

A **B** **C**

pi pɛ pa pɔ pu
bi bɛ ba bɔ bu

pi pɛ pa pɔ pu
bi bɛ ba bɔ bu

pi pɛ pa pɔ pu
bi bɛ ba bɔ bu

D **E** **F**

ti tɛ ta tɔ tu
di dɛ da dɔ du

ti tɛ ta tɔ tu
di dɛ da dɔ du

ti tɛ ta tɔ tu
di dɛ da dɔ du

G **H** **I**

ki kɛ ka kɔ ku
gi gɛ ga gɔ gu

ki kɛ ka kɔ ku
gi gɛ ga gɔ gu

ki kɛ ka kɔ ku
gi gɛ ga gɔ gu

Leaping to a Controlled Burst

Ascending leaps have a way of inducing vocal tension. When exaggerated plosive consonants are included as part of the gesture, the risk of poor vocal production is even greater. The following exercises are designed to develop proper coordination of breath, phonation, resonance, and articulation in increasing larger leaps. The lead-in syllable /ni/ was chosen to establish a clear, forward sound, but another may be suitable depending on the needs of the choir. Exercise 11.1 approaches a plosive burst via stepwise motion;


Exercise 11.2 approaches it via an ascending third, and so on.³

Exercise 11.1




/ ni _____ ta /
/ ni _____ da /

Exercise 11.2




/ ni _____ ta _____ /
/ ni _____ da _____ /

Exercise 11.3



/ ni _____ ta _____ /
/ ni _____ da _____ /

Exercise 11.4



/ ni ta _____ /
/ ni da _____ /

³ The plosives /t/ and /d/ are shown in Exercise 11.1–11.4 but other phonemes should be substituted for them to exercise other articulations.

Canon for Consonants

The descending five-note scale used to train basic techniques for consonant production has been modified into a simple four-part canon (Exercise 12). It can be used to help singers make the transition from unison singing to harmonized singing. Singers should continue to apply clear consonant articulation and resonant vowel production while attending to sectional unity, intonation, ensemble rhythm, and harmonic balance.

Exercise 12. Template for a canon with consonants.

S.

A.

T.

B.

The following examples demonstrate ways of using Exercise 12 to practice different types of articulation. Example 1 contains a single initial consonant (CV) in each voice part. In Example 2, each part contains an initial consonant as well as intervocalic consonants that should be executed quickly to maintain *legato*. Example 3a contains an initial consonant, a quick intervocalic consonant, and a geminated consonant.

Example 1. Canon with a single initial consonant.

S. / pa / / ba /

A. / pa / / ba /

T. / pa / / ba /

B. / pa / / ba /

Example 2. Canon with initial and intervocalic consonants.

S. / pa - pa - pa / / ba - ba - ba /

A. / pa - pa - pa / / ba - ba - ba /

T. / pa - pa - pa / / ba - ba - ba /

B. / pa - pa - pa / / ba - ba - ba /

Example 3a. Canon with initial, intervocalic, and geminated consonants.

S. / pa - pap - pa /
/ ba - bab - ba /

A. / pa - pap - pa /
/ ba - bab - ba /

T. / pa - pap - pa /
/ ba - bab - ba /

B. / pa - pap - pa /
/ ba - bab - ba /

Example 3b. Narrow transcription of Example 3a.

S. [pa____ pa p̰____]
[pa____ pap̰ː____ pa____]

A. [pa____ pap̰ː____ pa____]

T. [pa____ pap̰ː____ pa____]

B. [pa____ pap̰ː____ pa____]

Fusing Consonant and Vowel Pairs

The following exercise group is designed to develop consistent articulation and resonance by cycling through various consonant-vowel combinations. The vowels

alternate between front and back vowels while the consonants alternate between unvoiced and voiced pairs (except for Exercise 14.7 and 14.8). The musical setting helps to develop ensemble intonation by focusing on harmonic octaves and fifths, and ascending semitones. The pinpoint tuning required for these sonorities typically heightens ensemble awareness, which tends to have a positive influence on overall resonance.

Exercise 12.1. Bilabials plosives and vowels.

S. / pi pu bi bu bi pe po be bo be pɛ ɔ bɛ ɔ pa pa ba pa /

A. / pi pi pu bi bu bi pe po be bo be pɛ ɔ bɛ ɔ pa ba pa /

T. / pi pu bi bu bi pe po be bo be pɛ ɔ bɛ ɔ pa pa ba pa /

B. / pi pi pu bi bu bi pe po be bo be pɛ ɔ bɛ ɔ pa ba pa /

Exercise 14.2. Alveolar plosives and vowels.

S. / ti tu di du ti te to de do de tɛ ɔ dɛ ɔ ta ta da ta /

A. / ti ti tu di du ti te to de do te tɛ ɔ dɛ ɔ ta da ta /

T. / ti tu di du ti te to de do de tɛ ɔ dɛ ɔ ta ta da ta /

B. / ti ti tu di du ti te to de do te tɛ ɔ dɛ ɔ ta da ta /

Exercise 14.3. Velar plosives and vowels.

S. 

A. 

T. 

B. 

Exercise 14.4. Labiodental fricatives and vowels.

S. 

A. 

T. 

B. 

Exercise 14.5. Alveolar fricatives and vowels.


S. 
/ si su zi zu si se so ze zo se sɛ sɔ vɛ zɔ sa sa zɑ sa /

A. 
/ si si su zi zu si se so ze zo se sɛ sɔ zɛ zɔ sa zɑ sa /

T. 
/ si su zi zu si se so ze zo se sɛ sɔ vɛ zɔ sa sa zɑ sa /

B. 
/ si si su zi zu si se so ze zo se sɛ sɔ zɛ zɔ sa zɑ sa /

Exercise 14.6. Dental fricatives and vowels.

S. 
/ θi θu ði ðu θi θe θo ðe ðo θe θɛ θɔ ðɛ ðɔ θa θa ðɑ θa /

A. 
/ θi θi θu ði ðu θi θe θo ðe ðo θe θɛ θɔ ðɛ ðɔ θa θa ðɑ θa /

T. 
/ θi θu ði ðu θi θe θo ðe ðo θe θɛ θɔ ðɛ ðɔ θa θa ðɑ θa /

B. 
/ θi θi θu ði ðu θi θe θo ðe ðo θe θɛ θɔ ðɛ ðɔ θa θa ðɑ θa /

Exercise 14.7. Post-alveolar consonants and vowels.

Exercise 14.7 is a musical exercise for four voices (Soprano, Alto, Tenor, Bass) focusing on post-alveolar consonants and vowels. The score is written in G major (one sharp) and 4/4 time. Each staff contains a vocal line with notes and a corresponding phonetic transcription below it. The transcriptions are: /fi fu zi zu fi fe fo ze zo fe fɛ ʒɔ zɛ ʒɔ fa ʒa ʒa /.

Exercise 14.8. Alveolar consonants and vowels.

Exercise 14.8 is a musical exercise for four voices (Soprano, Alto, Tenor, Bass) focusing on alveolar consonants and vowels. The score is written in G major (one sharp) and 4/4 time. Each staff contains a vocal line with notes and a corresponding phonetic transcription below it. The transcriptions are: /li lu ni nu li le lo ne no le lɛ lɔ nɛ nɔ la la nɔ la /.

Exercise 14.7 does not alternate between an unvoiced and voiced consonant pair as in previous exercises. /l/ and /n/ were paired because they share a place of articulation at the alveolar ridge.

Exercise 14.9. Alveolar trill and alveolar tap.

S. [ri - ru - ri - ru - ri re-ro-re-ro - re rɛ-ɾɔ-rɛ-ɾɔ - ra ra - rɑ - ra]

A. [ri ri - ru - ri - ru - ri re-ro-re-ro - re rɛ-ɾɔ-rɛ-ɾɔ ra - rɑ - ra]

T. [ri - ru - ri - ru - ri re-ro-re-ro - re rɛ-ɾɔ-rɛ-ɾɔ - ra ra - rɑ - ra]

B. [ri ri - ru - ri - ru - ri re-ro-re-ro - re rɛ-ɾɔ-rɛ-ɾɔ ra - rɑ - ra]

Exercise 14.9 does not include a voiced and unvoiced pair, but rather focuses on the distinction between alveolar trills and alveolar taps. The alveolar trill [r] is used as the initial consonant and the alveolar tap [ɾ] is used intervocally.

Mouth Closure in the Upper Register

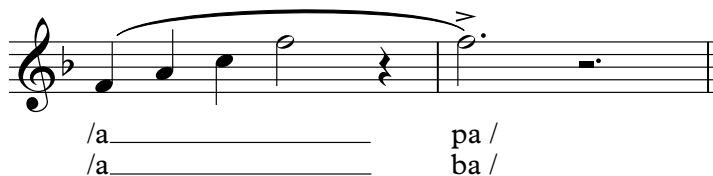
As discussed by Emmons and Chase, consonants that require mouth closure (e.g. /p, b, m, s, z, ʃ, ʒ, f, v/) are more difficult to produce in the upper register because extremely high pitches generally require jaw lowering (see pg. 40-41). Exercise 15.1-15.2 may be used to coordinate a balance between beautifully produced tone and the intelligibility of the consonant. The exercises should be transposed accordingly.

Exercise 15.1

/a _____ pa /

/a _____ ba /

Exercise 15.2



Emmons and Chase recommended that in instances where a consonant must be produced and certain voice parts (typically the sopranos and tenors) sing high notes, those sections should alter the consonant so that the mouth does not close completely. Meanwhile, the lower voice parts (typically the altos and basses) should take greater responsibility for the projection of the consonant.¹ When this technique is employed, rhythmic unification of the consonant and the altered consonant is essential. These skills may be developed through the following exercises. In *version a* of each exercise, the consonant is emphasized without gemination. In *version b* of each exercise, the lower voices perform consonant gemination and release the plosive with a controlled burst. The upper voices should release their vowel on the rest and re-enter exactly with the lower voices' plosive release.

¹ Emmons and Chase, *Prescriptions for Choral Excellence*, 88-89.

Exercise 16.1a

S.

A.

T.

B.

Exercise 16.1b

S.

A.

T.

B.

Exercise 16.2a

S.

A.

T.

B.

Exercise 16.2b

S.

A.

T.

B.

Exercise 16.3a

S.

A.

T.

B.

Exercise 16.3b

S.

A.

T.

B.

Exercise 16.4a

S.

A.

T.

B.

Exercise 16.4b

S.

A.

T.

B.

Consonant Intonation

Consonants that can be sustained on a pitch (e.g. voiced fricatives, approximants, and nasals) can have a negative impact on intonation if left unattended. The following exercises may be used to practice sustaining consonants in a harmonic progression. The transition from consonant to vowel also contains a transition of pitch. For example, in Exercise 17, in the soprano voice sustains an F on /v/ (beat four of measure two) which then releases into a G sustained on /i/. Pitch transitions and consonant-to-vowel transitions must be unified with exact rhythm in all voice parts. Exercise 17 develops this skill through stepwise motion in each voice part and Exercise 18 expands to larger intervals. (They may be performed individually or consecutively.) Exercise 19 is designed for the practice of well-tuned arpeggiation in each voice part.

Exercise 17.

Exercise 17 is a four-part vocal exercise. The Soprano part (S.) has lyrics: / v i v i v i v i v i v i v i /, with a long horizontal line under the final 'i'. The Alto part (A.) has lyrics: / vi vi vi vi vi vi vi /, with a long horizontal line under the final 'vi'. The Tenor part (T.) has lyrics: / vi vi vi vi vi vi vi /, with a long horizontal line under the final 'vi'. The Bass part (B.) has lyrics: / vi vi vi vi vi vi (v) vi /, with a long horizontal line under the final 'vi'. The phonetic annotations are: / v i v i v i v i v i v i v i / for Soprano, / vi vi vi vi vi vi vi / for Alto, / vi vi vi vi vi vi vi / for Tenor, and / vi vi vi vi vi vi (v) vi / for Bass.

Exercise 18.

/ v i v i v i v i v i v i _____ /
 / vi vi vi vi vi vi vi /
 / vi vi vi vi vi vi vi /
 / vi vi vi vi vi vi (v) vi /
 / vi vi vi vi vi vi vi /

Exercise 19.

/ u _____ vi vε va vo vu /
 / u _____ vi vε va vo vu _____ /
 / u _____ vi vε va vo vu _____ /
 / vi vε va vo vu _____ /

The exercises presented in this chapter do not address every conceivable consonant-related issue. Texted choral repertoire contains a myriad of phonetic challenges and not every choir will experience the same set of difficulties. Choral directors must be attuned to the actual abilities of their singers so that the exercises, or modified versions of them, can be used appropriately. Rather than using them simply as routine exercises, directors are encouraged to consider the pedagogical principles demonstrated through the exercises so that they may formulate their own strategies based on the needs of their choir.

CONCLUSION

Consonant production is frequently treated as a subset of vocal technique rather than as an essential part. Many agree in principle that consonants are important, especially for rhythm, intelligibility, and artistry, but fewer devote ample attention and practice time to their development. Common choral warm-ups focus on vowel production, intonation, vowel unification, posture, breathing, resonance, register blending, and musicianship. When consonants are utilized in warm-ups, all too often they are simply taught incorrectly. Spoken consonants, exaggerated consonants, or consonants that are arbitrarily included in vocal exercises does not necessarily beget good consonant production. Many times consonants are kept separate from vowels, and when they are inevitably united in repertoire, the singers have difficulty managing articulatory transitions.

Choristers are better served when proper consonant production is consistently taught in warm-ups. The dichotomy between consonant production and vowel production creates a complex problem for singers. When the problem is addressed in warm-ups—which for most choral singers is “the primary source of vocal technical information”²—the singers become more apt to navigate the challenges of articulation. As stated by Sally L. Glover, “Skills that have been mastered in warm-ups can be transferred easily into repertoire, increasing musical productivity and enjoyment for the singers.”³ Moreover, when the realization of balanced articulation and resonance is prioritized in technical

² Brenda Smith and Robert Thayer Sataloff, *Choral Pedagogy* (San Diego, CA: Singular, 1999), 162.

³ Sally Louise Glover, “How and Why Solo and Choral Warm-ups Differ,” *The Choral Journal* 42, no. 3 (October 2001), 18.

training, the singers become more adept at self-correcting consonant-related vocal faults.

This study has shown that proper consonant production can and should be trained systematically instead of on a case-by-case basis as challenges present themselves in repertoire. Effective diction is not only knowing what sounds to produce—that which is gained from IPA. It is also having the skills necessary to produce the sounds in their best form. Choral directors whose pedagogy includes the development of these skills will cultivate excellent singers.

Source: IPA Chart, <http://www.internationalphoneticassociation.org/content/ipa-chart>, available under a Creative Commons Attribution-Sharealike 3.0 Unported License. Copyright © 2005 International Phonetic Association.

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